

INCIPIENT
PULMONARY TUBERCULOSIS.

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DIAGNOSIS AND TREATMENT
OF
INCIPIENT PULMONARY TUBERCULOSIS

THE
BRADSHAW LECTURE
ON
THE DIAGNOSIS AND TREATMENT OF
INCIPIENT PULMONARY TUBERCULOSIS

*Delivered before the Royal College of Physicians of London
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BY

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PREFACE

IN this Lecture it is claimed—

1. That the existence of an incipient pulmonary tuberculosis can be easily demonstrated by careful percussion (provided that during the examination of the front of the chest the patient *is in the recumbent position* with relaxed muscles) long before any bacteriological evidence is obtainable, and while the auscultatory evidence is still insufficient for a diagnosis.

2. That a negative bacteriological report is often fatally deceptive, and that to wait for the demonstration of bacilli in the sputum is like postponing the diagnosis of cancer until the glands are involved.

3. That in the earliest stage of a pulmonary tuberculosis it is always possible, and in a somewhat later stage usually possible, to obtain prompt and permanent arrest of the disease by the employment of the method of continuous antiseptic inhalation. The evidence on which this statement is based is given in the Table of seventy cases, the clinical facts of which are stated in the papers reprinted as appendices to the Lecture.

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THE BRADSHAW LECTURE

On the Diagnosis and Treatment of Incipient Pulmonary Tuberculosis

SIR THOMAS BARLOW AND FELLOWS OF THE ROYAL COLLEGE OF PHYSICIANS,—William Wood Bradshaw, M.D., F.R.C.S., M.R.C.P., in memory of whom this lectureship was established by his widow, was a Member of this College engaged in general practice. It seems appropriate, therefore, that the Bradshaw lecturer should select a subject in which general practitioners are specially interested, and should endeavour to elucidate questions of diagnosis and of treatment in such a manner as shall be helpful to them in their daily work. No subject is more important to the general practitioner than the diagnosis and treatment of incipient pulmonary tuberculosis; no morbid condition more frequently claims his attention; in none is a correct diagnosis and a suitable treatment more necessary for the welfare of the patient and for the reputation of the practitioner.

There is at present a special need for a careful discussion of this subject, for it is now proposed to spend a large sum of public money on an organised effort to secure the effective treatment of pulmonary tuberculosis, and if possible to stamp out the disease. The patient work of the last few years, bacteriological, clinical and social, has thrown new light on the various problems involved

in the subject of tuberculosis. Never before have we had so large an army of workers, both scientific and practical, engaged in the effort to combat it. In Great Britain, in Germany, in France, and in America, the attention of the medical profession and of the public has been directed as never before to this most important matter, and there are journals entirely devoted to the consideration of tuberculosis and of everything connected with it. By these researches and discussions much valuable knowledge has been acquired, but it cannot be said that the proper treatment for pulmonary tuberculosis has been clearly and finally determined. Yet surely at this time, when a national effort is being organised, and when large contributions from the national resources are to be furnished in support of this effort, it is highly desirable that the most effective measures and (as far as possible) the least costly should be adopted, so that the greatest possible benefit may be secured and the funds provided may be most economically administered. This unexpected but most welcome therapeutic opportunity is a call to the medical profession to consider carefully what measures they will recommend. It is ours to direct this campaign. Are we quite clear in our minds as to the precise measures which ought to be employed?

The magnitude of the task before us is evident. According to the reports of the Registrar-General for 1910 (the latest available) the deaths in England and Wales assigned to tuberculous affections in the aggregate numbered 51,317, of which 36,334 (or 71 per cent.) were attributed to "phthisis." The returns for Ireland for the same year give 10,016 deaths from all forms of tuberculous disease, of which 7,527 were due to pulmonary tuberculosis. The returns for Scotland for the year 1910 are still incomplete, but the statement is made that in eight of the principal towns, comprising 38 per cent. of the population of Scotland, the number of deaths from tuberculosis was 3,458, of which 2,175 were due to pulmonary tuberculosis. This would approximately correspond to 9,100 and 5,724

respectively for the whole population. Combining these returns we have—

	Deaths in 1910	
	From all forms of tuberculosis.	From pulmonary tuberculosis.
England and Wales -	51,317	36,334 = 71%
Ireland - - -	10,016	7,527 = 75%
Scotland - - -	9,100	5,724 = 63%
Totals - - -	70,433	49,585

We may, therefore, say that about 50,000 deaths from pulmonary tuberculosis occur every year in the United Kingdom, and 20,000 more from other forms of tuberculosis.

RELATIVE INCIDENCE OF HUMAN AND BOVINE TYPES OF TUBERCULOSIS.

The pathological, clinical, bacteriological, and experimental work of the last few years has taught us that the problem of tuberculosis may be resolved into two separate problems of unequal magnitude, which arise from the action of two distinct types of the bacillus tuberculosis—the “bovine” and the “human.” In an address delivered before the International Conference on Tuberculosis at Rome in April, 1912, Professor G. Sims Woodhead reported the results of the investigation of this subject by the British Royal Commission on Tuberculosis.¹ The sputum of 28 cases of pulmonary tuberculosis under treatment in hospital was examined; in 26 of these the human type of bacillus was found, in only 2 the bovine. In 14 cases of primary pulmonary tuberculosis examined post mortem the human type of bacillus was found in all, the bovine in none. In 3 cases of generalised tuberculosis, in all of which the lungs were affected, only the human type was found. In 14 cases of tuberculosis of bones and of

¹ *The Lancet*, June 1st, 1912, p. 1451.

joints the human type was detected in all, the bovine in only 1. Three cases of tuberculosis of the kidney, suprarenal, and testicle yielded the human type only. But in 5 cases of tuberculosis of the bronchial glands the human type was found in 3 and the bovine in 2. Of 9 cases of tuberculosis of the cervical glands the human type was found in 6, the bovine in 3. In 29 cases of primary abdominal tuberculosis 13 proved to be of the human type, while no fewer than 14 were bovine, and in 2 instances both types were present. It is interesting to note that of the 14 purely bovine cases 10 were aged from 1-3 years, 3 from 4-5 years, and the remaining case was only 8 years old. The result of the investigation is summed up thus : In 108 cases of tuberculosis in man 84 yielded the human type only, 19 the bovine type only, and 5 both types—that is to say, 89 human to 24 bovine, a ratio of nearly 4 to 1 in the specimens examined. The bovine type, however, was found chiefly in tuberculosis of the abdominal organs, and of the cervical and bronchial glands, and even in these almost exclusively in early childhood. It appears to have very little influence in the production of pulmonary tuberculosis, and as five-sevenths of the total mortality from tuberculosis is due to disease of the lungs, it is quite clear that the complete annihilation of the bovine type of the bacillus would make very little difference to the mortality from phthisis.

The problem of the bovine bacillus is therefore almost insignificant in comparison with that of the human bacillus ; yet it is not to be neglected, for it is responsible for a considerable number of deaths in early life. Theoretically the problem of the bovine bacillus is easy of solution. Hygienic methods universally applied in all dairies and dairy-farms, careful selection of cows with exclusion of tuberculous animals, proper arrangements for the conveyance and distribution of milk, and the practice of sterilisation of milk by heat ought to be capable of abolishing the “ bovine type ” of tuberculosis in man.

But how are we to attack the "human type" of tuberculosis, which causes nearly 50,000 deaths annually in the United Kingdom from disease of the lungs, and probably at least a half of the 20,000 deaths from tuberculosis of other organs? This is a serious problem indeed, and one which might seem to be hopeless. The clue to its solution evidently lies in the predominant localisation in the lungs. If the bacillus can be conquered here the battle would be won. The crucial point of the struggle against tuberculosis in general is this: Is it possible to abolish phthisis? For if pulmonary tuberculosis could be annihilated there would be no spread of infection by means of sputum, and there would be little or no infection of other organs in the patients themselves. This, then, is the question which urgently needs consideration. For the answer we must go far back—to the *individual case of incipient pulmonary tuberculosis* and to the *individual medical practitioner* who is called upon to diagnose and to treat it. The abolition of pulmonary tuberculosis is possible on two conditions, and only on these conditions; first, that every practitioner shall learn how to detect the disease at its first appearance, long before any bacteriological evidence is available; and secondly, that a method of treatment can be employed by the practitioner, in the patient's own home, which will be simple, harmless, completely effective, and yet inexpensive. If these two conditions can be satisfied the solution of the problem is in our hands. I propose, therefore, to devote this lecture to a discussion of these two questions.

I. THE DIAGNOSIS OF INCIPIENT PULMONARY TUBERCULOSIS.

At present the great majority of general practitioners do not feel justified in giving a definite diagnosis of incipient pulmonary tuberculosis until the bacillus has been found in the patient's sputum, either by themselves or by some acknowledged bacteriological expert. This is unfortunate,

for the disease is often present for weeks or months, and may have spread extensively in the lungs, before a positive bacteriological report can be given. Much time, therefore, has been lost before systematic treatment has been undertaken. The delay caused by waiting for a positive report is responsible for a large amount of mortality.

Principiis obsta. Sero medicina paratur
Quum mala per longas convaluere moras.

A negative bacteriological report may be entirely misleading and, indeed, calamitous in its results, for it may delude the patient and the practitioner into a false sense of security, so that the disease goes on its way unchecked until its manifestations become too plain to be any longer ignored. Let the medical man constantly bear in mind that in the detection of disease absence of proof is not the same thing as proof of absence. The fact that no bacilli can be detected in the sputum is no proof whatever that they do not exist in the lungs.

Value of Percussion.

But if the practitioner, conscious of the danger of waiting for a positive bacteriological report and of relying on a negative report, proceeds to make a careful physical examination of the patient's lungs, he at once finds himself in a difficulty. For if he studies his text-books to ascertain precisely how this examination ought to be conducted, if he seeks advice from those who are acknowledged to be experts in tuberculosis, if he reads the most recent monographs and articles in the medical journals, he finds that they all, with one consent, in considering the diagnostic evidence of incipient pulmonary tuberculosis, lay stress on auscultation and say very little about percussion. Yet the auscultatory signs may be very slight indeed when the percussion signs are well marked and entirely distinctive. Quite large dull areas may be present in the positions characteristic of a tuberculous infection of the lungs, and yet there may be few or no evidences of local catarrh ;

there may be nothing abnormal observable by the most careful auscultation except a defect in the entry of air. We may learn much from the stethoscope, but in early microbic infections of the lungs we may learn much more by the skilled use of our own fingers. In the earliest stage of a pneumococcal invasion of the lungs, 24 or 36 hours after the initial rigor, it is usually possible by careful percussion to detect a small area of defective resonance, usually near the base of one lung, with diminished air-entry as the only auscultatory phenomenon. This condition may exist for about 24 hours, but as the consolidation of lung progresses sharp inspiratory crepitus and bronchial breathing are developed. It is not often that there is the opportunity for a post-mortem examination on a case of pneumonia in its earliest stage, but I have found in such a case the suspected area of lung collapsed, almost airless, and very full of blood.

Similarly in incipient pulmonary tuberculosis the earliest signs are local areas of dullness with defective air-entry as the only constant auscultatory phenomenon, though some catarrhal sounds may possibly be present in addition. But there is a marked difference in the rapidity of development in the pneumococcal and in the tuberculous infection of the lungs. The pneumococcal invasion is extremely rapid and often overwhelming; in six or seven days the tragedy is complete and the curtain falls. But the tuberculous invasion is as a rule very slow and insidious, as if the bacillus found great difficulty in establishing itself. For weeks or months the process may continue with very little general indication. Even cough may be entirely absent, no pyrexia may be detected, and loss of weight, tiredness, flushing, or occasional night-sweats may be the only symptoms. A worker in the bacteriological laboratory at St. Mary's Hospital was found to have a varying opsonic index to tubercle, though he felt quite well. He came to me and requested me to examine his lungs. I found minimal areas of dullness with defective air-entry in the positions characteristic of an incipient

pulmonary tuberculosis. He went to a sanatorium, where two months later he had a pyrexial attack lasting a week, and a few tubercle bacilli were found in his (very scanty) sputum. He remained in the sanatorium four months and gained 8 lb. in weight. I examined him again on his return, and found all the dull areas distinctly larger but quiescent. He has remained since then in good health and has done excellent and continuous work.

It is, therefore, not surprising that the practitioner too often fails to detect an incipient pulmonary tuberculosis until the disease is far advanced. In the earliest stage careful and accurate percussion is required for its detection, and the text-books insist almost wholly on auscultation !

Sites of Dull Areas and Method of Percussion.

It cannot be too much insisted on that if any practitioner will acquire the habit of carefully and invariably examining the heart and lungs by accurate percussion before using his stethoscope, he will very greatly increase his ability to form a correct diagnosis, and will gain invaluable indications for treatment. But at what part of the thorax may the practitioner hope to detect the earliest indications of an incipient pulmonary tuberculosis ? He will naturally turn to the "apex" of the lung, and on consulting some of his authorities will be instructed to percuss above the clavicle to detect a disease which such authorities imagine to commence at the extreme summit of the lung and to advance steadily downwards. The progress of the disease has even been divided into "stages" in accordance with the distance downwards from the summit attained by the morbid process, the affection of the lower lobes being often ignored altogether in such classification. Yet it was pointed out more than twenty years ago, in a valuable paper by a distinguished Fellow of this College, Sir James Kingston Fowler, that post-mortem examination of the precise site of the earliest tuberculous lesions of the lung shows that the tuberculous process does not

begin in the summit of the lung, but at a spot about an inch and a half below the summit, from which the morbid process may extend backwards and also downwards. Sir James Kingston Fowler showed that a second localisation in the outer part of the upper lobe at the same horizontal level is also extremely common, and that a third early focus is very frequently present at about an inch and a half below the summit of the lower lobe on each side.

Can we detect these local areas of incipient pulmonary tuberculosis by accurate percussion? If we are to succeed in this attempt it is essential to adopt a correct method of examination. For the investigation of the front of the chest the patient *must lie on his back on a comfortable couch*, and must be completely at his ease and with his muscles relaxed. It is impossible to obtain an accurate result from percussion of the front of the chest while the patient is standing or sitting erect; the habit of physicians to examine such patients in the erect position has been the cause of the delay in the recognition of the true picture of the localisation of an early pulmonary tuberculosis. If the patient is in the recumbent position on a comfortable couch which supplies an adequate resistance, and at the same time allows of complete muscular relaxation, it is quite easy by careful percussion to detect dull areas in the first and second intercostal spaces which correspond to the statements made by Sir James Kingston Fowler, if it be remembered that a distance of an inch and a half in the collapsed lung of the post-mortem room will correspond to a distance of two inches or more in the air-containing lung during life. Of course, it is important to adopt a proper method of percussion. Let the practitioner practise light percussion on the terminal phalanx of a finger of his left hand firmly pressed on the spot to be percussed (the rest of that hand and forearm being kept away from the patient's chest-wall). After a little careful practice of this method he will have no difficulty in determining in a case of incipient pulmonary tuberculosis dull areas in the inner and in the outer part of the

first intercostal space on each side. The second and the third interspaces must then be examined in the same way, and the remaining parts of the anterior wall of the chest and also the axillary regions. For the posterior aspect of the thorax the patient should be sitting erect with his back to the practitioner; he should place his hands on the anterior aspect of the opposite shoulders, should bend gently forwards and relax his muscles. Careful percussion should then be practised over the inner and the outer parts of the suprascapular fossa on each side, and also over the posterior end of the spine of the scapula and the surrounding region. In a case of incipient pulmonary tuberculosis a dull area will be found in the inner part of the suprascapular fossa, quite close to the first and second dorsal vertebræ (a region normally resonant), which corresponds anteriorly to the dull area in the inner part of the first intercostal space. Similarly, a dull area (smaller in size) will be found in the outer part of the suprascapular fossa, which corresponds to a dull area in the outer part of the first intercostal space. Thirdly, a very definite dull area, as large as or even larger than the area first described, will be found in the upper part of the lower lobe at the extremity of the spine of the scapula.

On examining the subclavicular dull areas more carefully, it will be found that they can usually be traced downwards into the second intercostal space, being in this space smaller but nearer together than in the first space. In a severe case the outer part of the second space may be involved, and (more rarely) the dullness may extend under the anterior fold of the axilla into the axillary region. It should also be observed that though at first the dull area in the inner part of the first space extends quite up to the sternum, as the patient improves resonance begins to appear at the sternal edge and may extend from one to two centimetres, so that the focus of morbid action is situated at about a fingerbreadth from the sternum.

There are, therefore, six dull areas to be detected in the upper part of the lungs in a case of incipient pulmonary

tuberculosis, two in each upper lobe and one in each lower lobe. Over these dull areas the only auscultatory phenomenon in many cases is a defect in the air-entry. Even the deepest possible inspiratory effort on the part of the patient produces very little inspiratory sound at these localities, while in the lower part of the lungs the air-entry may be much more distinct. On careful auscultation one may sometimes detect a slight crepitant sound with inspiration or with expiration also; it may or may not vanish after the patient has coughed. Occasionally the inspiration will be slightly "wavy" in rhythm; occasionally the expiration will be slightly prolonged. At this stage of the disease there is rarely any increase in the conduction of voice-sounds.

The six dull areas above described may all be present and even of considerable size, while the supraclavicular region, corresponding to the summit of the lung, may be still very fairly resonant, though the clavicle itself may yield a dull note in the positions corresponding to the dull areas below.

These six areas at the four apices are the most important and the most easily detected part of the morbid signs of an incipient pulmonary tuberculosis. They do not represent the complete picture—far from it, as I shall show presently. But they are sufficient for the diagnosis. They are, I believe, invariably present in all cases of early pulmonary tuberculosis, though in a small minority certain areas about the angle of the scapula (of which I shall speak later) may become unusually definite, especially if any pleurisy develops over them.

Diagnostic Value of Typical Dull Areas.

To prove that these typical dull areas are not produced by any other type of disease is obviously more difficult, and requires a much wider range of careful clinical observation. Yet I believe it to be the fact. The condition which may simulate them most nearly is the tendency to lobular collapse of the apices which is not uncommon in

feeble children ; but this condition rarely, if ever, attains to the typical symmetrical distribution of the six dull areas of pulmonary tuberculosis. An influenzal or pneumococcal broncho-pneumonia does not usually affect the apices in this definite and symmetrical fashion, and the distribution of the dull areas caused by pulmonary infarcts is very different.

Those physicians who insist on the demonstration of the bacillus in the sputum as the only proof of the reality of pulmonary tuberculosis will, of course, be sceptical as to the tuberculous nature of lesions found at so early a stage of the disease that this convincing evidence cannot be produced. Yet the exact similarity of the condition found in these early cases, which promptly respond to treatment, to that found in more developed cases in which the bacillus can be demonstrated, seems to me to make it at least highly probable that they also are tuberculous. Much more extended observation is, of course, necessary to attain to absolute certainty that these six dull areas are not produced by any other infection, but at all events it is quite clear that they justify a very strong suspicion of a tuberculous infection, present or past.

It must be carefully noted that the discovery of these six areas at the four apices does not necessarily prove that the tuberculous infection which has produced them is active at the time when they are discovered. For though they diminish in size as the patient improves, they do not entirely disappear. They may remain quiescent but detectable for many years. While preparing this lecture I had the opportunity of examining again the chest of a lady who had been under my care eleven years ago for a slight pulmonary tuberculosis. She made a complete recovery, did hard and continuous work as a nurse, and for some years as a hospital sister in a trying climate. She came to me again, not on account of her lungs, but for examination of her heart. Yet the characteristic dull areas at the pulmonary apices due to the tuberculous infection eleven years before could be detected quite

easily, though there was absolutely no morbid sound to be heard over them. It is probable that these old dull areas caused by former tuberculous infection remain during the rest of the patient's life. They are no doubt in large part due to local fibrosis, small pulmonary scars. How long they may yet contain living bacilli, which may under favourable circumstances again start a morbid process, it is impossible to say. Certainly for some months after apparent recovery these areas ought to be very carefully watched, for an increase in the size of any of them may explain doubtful clinical symptoms, and may show the necessity for renewed treatment. But after a time they may certainly become completely quiescent.

It is always wise, on the first discovery of the typical areas at the four apices, to consider carefully whether there are any indications of present activity, such as tenderness, pyrexia, cough, hæmoptysis, or local crepitant sounds. Whenever any reasonable ground for suspicion of active disease exists, a week or ten days of rest in bed with continuous antiseptic inhalation should be instituted as a precautionary measure. The result will often show that this treatment has been wise, for the active signs will subside and the dull areas will become definitely smaller.

*Progress of Case indicated by Periodical Measurement of
Dull Areas.*

When the practitioner has detected the existence of the six typical dull areas at the four apices in a case of suspected pulmonary tuberculosis, it is most important that he should *carefully measure their diameter*, and should keep a record of their size at the time of their first discovery, which can be compared with subsequent measurements made at intervals of three or four weeks. I have a large number of such records, and find them easy to make and of the greatest service in prognosis and in estimating the progress towards recovery. The size can be determined with very considerable accuracy, though not, of course,

with mathematical precision. To measure them in inches or centimetres would give a false idea of the amount of exactness possible under the circumstances, and would alarm the patient by the use of tape measures. But the measure by fingerbreadths is made during the routine process of physical examination and without the patient's knowledge. The fingerbreadth is a measure which is invariable for the same observer; it is (very literally) always at hand, and it admits of quite sufficient clinical accuracy. After a little practice it is possible to estimate the size of a dull area to one-sixth or even one-eighth of a fingerbreadth, approximately equivalent to one-third and one-quarter of a centimetre.

As evidence of the truth of the statements just made I submit the following figures, obtained by myself in eight recent cases. The first six are very early (unpublished) cases, in which an X ray examination was made, so that the results of both methods of examination can be compared. The seventh case shows how a slight relapse, due to excess of exercise, gave evidence of increase in size of some of the dull areas, and how rest and continuance of the antiseptic inhalations rapidly brought about subsidence of this extension. The eighth (unpublished) is a more chronic case, which has made remarkable improvement under the use of continuous antiseptic inhalation.

It must be explained that in each case the part of the diagram above the horizontal line presents the front view of the chest and shows the size of the dull areas in the first and second intercostal spaces, while the part below the horizontal line presents the back view of the chest and shows the size of the dull areas in the inner and outer parts of the suprascapular fossa, and at the extremity of the spine of the scapula on each side. The figures are in fingerbreadths and fractions of a fingerbreadth.

CASE I.—Female, aged 24.—Jan. 26th, 1912 (sent by Dr. J. Ashton, of Battersea). *Only definite symptom occasional night-sweats* for nearly a year; no cough or sputum. Her brother (Case 7 below) had been under my care for early pulmonary

tuberculosis and had recovered. Weight, 7 st. 12½ lb. (it was formerly 8 st. 1 lb.).

$$\begin{array}{c}
 1\frac{1}{2} \text{ --- } 2 \\
 1 \text{ --- } 1\frac{1}{2} \text{ ---}
 \end{array}
 \left|
 \begin{array}{c}
 \text{--- } 1\frac{1}{2} \text{ --- } 1 \\
 \text{--- } 1\frac{1}{4} \text{ --- } \frac{3}{4}
 \end{array}
 \right.
 \left.
 \begin{array}{l}
 \left. \begin{array}{l} \text{Poor entry} \\ \text{Slight crepitus} \end{array} \right\} \text{B.A.} \\
 \left. \begin{array}{l} 3 \text{ --- } 2 \\ 3 \end{array} \right\} \begin{array}{l} \text{Almost no entry, B.S.F.} \\ \text{Distinct crepitus B.A}_2. \end{array}
 \end{array}$$

The patient was kept in bed for 10 days and she practised continuous antiseptic inhalation.

Feb. 16th: Weight, 8 st. 2½ lb. (gain = 4 lb. in three weeks). Feels and looks better; still occasional night-sweats. Temperature to 99.4° F. for 3 days, now 98.8°.

$$\begin{array}{c}
 1 \text{ --- } 1\frac{1}{2} \text{ ---} \\
 \frac{2}{3} \text{ --- } 1 \text{ ---}
 \end{array}
 \left|
 \begin{array}{c}
 \text{--- } 1\frac{1}{2} \text{ --- } \frac{3}{4} \\
 \text{--- } 1\frac{1}{4} \text{ --- } \frac{3}{4}
 \end{array}
 \right.
 \left.
 \begin{array}{c}
 1 \text{ --- } 1\frac{2}{3} \quad 2 \text{ --- } 1\frac{1}{2} \\
 2 \qquad \qquad \qquad 2\frac{1}{2}
 \end{array}
 \right.$$

March 5th: Weight, 8 st. 5 lb. (total gain = 6½ lb.). Doing well. Night-sweats now "nothing like what they used to be." Temperature only once to 99.4°.

$$\begin{array}{c}
 \frac{3}{4} \text{ --- } 1\frac{1}{2} \text{ ---} \\
 \frac{1}{2} \text{ --- } 1 \text{ ---}
 \end{array}
 \left|
 \begin{array}{c}
 \text{--- } 1\frac{1}{2} \text{ --- } \frac{1}{2} \\
 \text{--- } 1\frac{1}{4} \text{ --- } \frac{1}{2}
 \end{array}
 \right.
 \left.
 \begin{array}{c}
 \frac{2}{3} \text{ --- } 1\frac{1}{2} \quad \text{--- } 1\frac{2}{3} \text{ --- } 1 \\
 1\frac{1}{2} \qquad \qquad \qquad 2
 \end{array}
 \right.$$

April 19th: Weight, 8 st. 8½ lb. (total gain = 10 lb.). Night-sweats slight. Temperature rarely reaches 99°. Dull areas a little smaller.

X Ray examination by Dr. Harrison Orton, April 23rd.— "The screen shows slight dimness on the *right* side; does not brighten so well as the left on deep inspiration. Diaphragm movements approximately equal and not markedly abnormal. The photograph shows a definite area of mottling in the first and second spaces in front (= the fourth and fifth behind) on the *right* side; there is also some mottling (but less definite) in the fifth right space in front. The *left* upper spaces show less definite mottling, but the left root-shadow is considerably more marked than the right, and shows several very opaque areas."

June 7th: Weight, 8 st. 10½ lb. in lighter dress (total gain = 13 lb.). Feels and looks very well. Night-sweats almost disappeared. Temperature entirely subnormal for last seven days.

$$\begin{array}{c}
 \frac{1}{2} \text{ --- } 1\frac{1}{4} \text{ ---} \\
 \frac{1}{3} \text{ --- } \frac{1}{2} \text{ ---}
 \end{array}
 \left|
 \begin{array}{c}
 \text{--- } 1\frac{1}{4} \text{ --- } \frac{1}{3} \\
 \text{--- } \frac{1}{2} \text{ --- } \frac{1}{4}
 \end{array}
 \right.
 \left.
 \begin{array}{l}
 \left. \begin{array}{l} \text{Very slight crepitus R.A.} \\ \text{Rather poor entry} \end{array} \right\} \begin{array}{l} \text{R.S.F.} \\ \text{R.A}_2. \end{array}
 \end{array}$$

July 26th: Weight still 8 st. 10½ lb. "Not a single sweat since last visit."

$\begin{array}{c} \frac{1}{3} \text{ --- } 1 \text{ ---} \\ \frac{1}{4} \text{ --- } \frac{1}{3} \text{ ---} \end{array} \left \begin{array}{c} - 1 \text{ --- } \frac{1}{4} \\ - \frac{1}{3} \text{ --- } \frac{1}{4} \end{array} \right.$	}	Breathing quite normal in front and at all posterior apices.
$\begin{array}{c} \frac{1}{2} \text{ --- } \frac{3}{4} \\ \frac{3}{4} \end{array} \left \begin{array}{c} 1 \frac{1}{2} \text{ --- } \frac{1}{2} \\ 1 \frac{1}{4} \end{array} \right.$		

CASE 2.—Female, aged 30.—March 6th, 1912 (sent by Dr. R. R. Mowll, of Surbiton). Has felt weak lately and unfit for work. Pain in left side of chest came on suddenly at night five weeks ago; for the first two days it hurt her to breathe. Since then feels a chronic soreness in left axilla. No cough, dyspepsia, or night-sweats. Weight, 8 st. 1½ lb. (8 st. 2 lb. last August).

$\begin{array}{c} 1 \text{ --- } 2 \\ \frac{3}{4} \text{ --- } 1 \frac{1}{2} \text{ ---} \end{array} \left \begin{array}{c} - 1 \frac{1}{2} \text{ --- } \frac{3}{4} \\ - 1 \text{ --- } \frac{1}{2} \end{array} \right.$	}	{L. front slightly tender. Slight double crepitus B.A. Poor entry B.S.F. Very slight prolonged expiration R.S.F. Slight crepitus B.A. ₂	} Also distinct friction crepitus at angle of scapula.
$\begin{array}{c} 1 \frac{1}{2} \text{ --- } 2 \\ 2 \end{array} \left \begin{array}{c} 2 \frac{1}{2} \text{ --- } 2 \\ 2 \frac{1}{2} \end{array} \right.$			

She was kept in bed for ten days and practised continuous anti-septic inhalation. March 27th: Left chest still rather sore. No cough. Weight, 8 st. 4½ lb. (gain = 3 lb. in three weeks).

$\begin{array}{c} \frac{3}{4} \text{ --- } 1 \frac{1}{2} \text{ ---} \\ \frac{1}{2} \text{ --- } 1 \frac{1}{4} \text{ ---} \end{array} \left \begin{array}{c} - 1 \frac{1}{4} \text{ --- } \frac{1}{2} \\ - \frac{3}{4} \text{ --- } \frac{1}{3} \end{array} \right.$	}	{Entry poor R.A., ,, fair L.A.} No crepitus.
$\begin{array}{c} 1 \text{ --- } 1 \frac{1}{2} \text{ ---} \\ 1 \frac{1}{2} \end{array} \left \begin{array}{c} 2 \text{ --- } 1 \frac{1}{2} \\ 2 \end{array} \right.$		

X ray examination by Dr. Orton, April 16th.—"The screen shows definite dimness of upper part of *right* lung as compared with the left. Diaphragm movements approximately equal on the two sides, but their range on both sides is well below the average. The photograph shows definite mottling on the right side, with several small opaque areas which suggest old fibrous nodules, especially in first space in front, corresponding to fourth space behind; in second space in front, corresponding to fifth space behind; and in third space in front (most marked) corresponding to seventh rib behind. On the *left side* there is only a little faint mottling lying over fourth rib behind and in first intercostal space in front; otherwise indefinite."

May 1st: No soreness during the last week. Still no cough. Weight, 8 st. 6 lb. (total gain = 4½ lb.).

$\begin{array}{c} \frac{1}{3} \text{ --- } 1\frac{1}{4} \text{ ---} \\ \frac{1}{3} \text{ --- } 1 \text{ ---} \end{array} \left \begin{array}{c} \text{--- } 1 \text{ --- } \frac{1}{3} \\ \text{--- } \frac{1}{2} \text{ --- } \frac{1}{4} \end{array} \right.$	}	Nothing abnormal on auscultation except very slight friction at angle of left scapula.
$\begin{array}{c} \frac{2}{3} \text{ --- } 1\frac{1}{3} \text{ ---} \\ 1\frac{1}{4} \text{ --- } 1\frac{1}{2} \text{ ---} \end{array}$		

June 5th: Feels well.

$\begin{array}{c} \frac{1}{3} \text{ --- } 1 \text{ ---} \\ \frac{1}{3} \text{ --- } \frac{1}{2} \text{ ---} \end{array} \left \begin{array}{c} \text{--- } \frac{2}{3} \text{ --- } \frac{1}{4} \\ \text{--- } \frac{1}{2} \text{ --- } \frac{1}{4} \end{array} \right.$	}	Very slight pleural crepitus at R.A. and at R.S.F.
$\begin{array}{c} \frac{1}{2} \text{ --- } 1\frac{1}{4} \text{ ---} \\ 1\frac{1}{4} \text{ --- } 1\frac{1}{2} \text{ ---} \end{array} \left \begin{array}{c} 1\frac{1}{2} \text{ --- } \frac{2}{3} \\ 1\frac{1}{2} \text{ ---} \end{array} \right.$		

CASE 3.—Female, aged 28.—March 2nd, 1912 (sent by Dr. A. M. Hickley, of South Lambeth Road, under whose care she had been in August, 1911, for pharyngitis and post-nasal catarrh). At the end of November, 1911, Dr. Hickley detected evidence of tuberculosis at the right apex, and prescribed treatment by continuous antiseptic inhalation; but she was not kept in bed. Her weight on Dec. 1st was 6 st. 3 lb.; it rose gradually to 6 st. 9 lb. On Feb. 22nd, 1912, a few *tubercle bacilli* were found in her sputum. Cough troublesome. Weight, 6 st. 8 lb.

$\begin{array}{c} 1\frac{2}{3} \text{ --- } 2\frac{1}{2} \text{ ---} \\ 1\frac{1}{3} \text{ --- } 1\frac{1}{2} \text{ ---} \end{array} \left \begin{array}{c} \text{--- } 1\frac{2}{3} \text{ --- } 1\frac{1}{3} \\ \text{--- } 1\frac{1}{4} \text{ --- } 1 \end{array} \right.$	}	Poor entry. No crepitus.
$\begin{array}{c} 1\frac{1}{2} \text{ --- } 2 \\ 2 \end{array} \left \begin{array}{c} 3 \text{ --- } 2 \\ 3 \end{array} \right.$		

Prolonged expiration R.S.F.

The patient was kept in bed for a fortnight and practised continuous antiseptic inhalation.

March 26th: Weight, 6 st. 9½ lb. (gain 1½ lb. in three weeks). Cough not much better.

$\begin{array}{c} 1 \text{ --- } 1\frac{2}{3} \text{ ---} \\ \frac{3}{4} \text{ --- } 1 \text{ ---} \end{array} \left \begin{array}{c} \text{--- } 1\frac{1}{4} \text{ --- } 1 \\ \text{--- } 1 \text{ --- } \frac{2}{3} \end{array} \right.$	}	Much better entry. Some prolonged expiration R.A. No crepitus.
$\begin{array}{c} 1 \text{ --- } 1\frac{2}{3} \\ 1\frac{1}{2} \end{array} \left \begin{array}{c} 2\frac{1}{2} \text{ --- } 1\frac{1}{2} \\ 2\frac{1}{2} \end{array} \right.$		

Entry still poor behind.
Some prolonged expiration R.S.F.
Very slight expiratory crepitus B.A.₂

X ray examination by Dr. Orton, April 2nd, 1912.—“The screen shows slight dimness at both apices, most marked at the right apex. Hesitating movement of the right side of the diaphragm. The photograph shows definite mottled shadowing more marked and more extensive on the right side than on the left. The plate confirms the dimness on the right side.”

April 23rd: Weight, 6 st. 10 lb. (total gain = 2 lb.).

$\begin{array}{c} \frac{3}{4} \text{ --- } 1\frac{1}{2} \text{ ---} \\ \frac{1}{2} \text{ --- } \frac{3}{4} \text{ ---} \end{array} \left \begin{array}{c} \text{--- } 1 \text{ --- } \frac{1}{2} \\ \text{--- } \frac{3}{4} \text{ --- } \frac{1}{3} \end{array} \right.$	}	Entry very fair. Slight prolonged expiration R.A.	} No crepitus.
$\begin{array}{c} \frac{3}{4} \text{ --- } 1\frac{1}{2} \\ 1\frac{1}{3} \end{array} \left \begin{array}{c} 2 \text{ --- } 1 \\ 2 \end{array} \right.$			

Entry fair R.S.F.
Some prolonged expiration R.A.₂ } No crepitus.

CASE 4.—Married woman, aged 35.—Sept. 3rd, 1912 (sent by Dr. G. Allpress Simmons, of Welbeck Street). “Caught cold” in July; it lasted for three weeks. Lately “brings up phlegm,” and on August 29th slight hæmoptysis. No pyrexia; no night-sweats; no dyspepsia, but loss of appetite. Weight, 8 st. $2\frac{1}{2}$ lb.

$\begin{array}{c} 1\frac{1}{2} \text{ — } 1\frac{2}{3} \text{ —} \\ 1 \text{ — } 1 \text{ —} \end{array}$	$\begin{array}{c} 1\frac{1}{2} \text{ — } 1 \\ 1 \text{ — } \frac{2}{3} \end{array}$	$\left. \begin{array}{l} \text{Entry poor R.A.} \\ \text{Slight wavy inspira-} \\ \text{tion L.A.} \\ \text{Slight prolonged ex-} \\ \text{piration L.A.} \end{array} \right\} \text{Hardly any} \\ \text{crepitus.}$
$\begin{array}{c} 1\frac{1}{2} \text{ — } 2 \\ 2\frac{1}{3} \end{array}$	$\begin{array}{c} 2\frac{1}{2} \text{ — } 1\frac{2}{3} \\ 3 \end{array}$	$\left. \begin{array}{l} \text{Definite slight inspira-} \\ \text{tory crepitus} \\ \text{Slight prolonged expiration} \\ \text{L.S.F. almost normal.} \end{array} \right\} \begin{array}{l} \text{R.S.F.} \\ \text{R.A.}_2 \\ \text{R.S.F.} \end{array}$

The patient was kept in bed for ten days and practised continuous antiseptic inhalation.

Sept. 24th: Feels “very well.” No cough except in the morning. Sputum slight. Weight, 8 st. $7\frac{1}{2}$ lb.: a gain of 5 lb. in three weeks.

$\begin{array}{c} 1 \text{ — } 1\frac{2}{3} \text{ —} \\ \frac{3}{4} \text{ — } 1\frac{1}{4} \text{ —} \end{array}$	$\begin{array}{c} 1\frac{1}{2} \text{ — } \frac{3}{4} \\ 1\frac{1}{4} \text{ — } \frac{1}{2} \end{array}$	$\left. \begin{array}{l} \text{Entry better R.A.} \\ \text{Slight prolonged expiration R.A.} \\ \text{Slight inspiratory crepitus L.A.} \end{array} \right\}$
$\begin{array}{c} 1 \text{ — } 1\frac{3}{4} \\ 2 \end{array}$	$\begin{array}{c} 2 \text{ — } 1\frac{1}{2} \\ 2\frac{1}{2} \end{array}$	$\left. \begin{array}{l} \text{Slight prolonged expiration R.S.F.} \\ \text{Slight crepitus R.A.}_2 \end{array} \right\}$

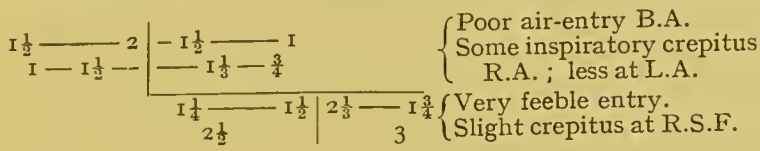
X ray examination by Dr. Orton, Sept. 24th.—Screen: “Dimness and failure to brighten of upper part of *right* lung. Right lung decidedly dimmer than left. Left probably dimmer than normal. Diaphragm movements diminished on both sides ($\frac{1}{8}$ th of an inch less on left than on right).” Photograph: “The right lung below lower border of third rib shows definite mottled shadowing. In the left lung there is a suspicion of mottled shadowing over first intercostal space and second rib in front (corresponding to fourth and fifth spaces behind).”

Oct. 22nd: Cough practically absent. Sputum very slight, but two weeks ago there was very slight hæmoptysis. None since. Weight, 8 st. $10\frac{1}{2}$ lb.: a total gain of 8 lb. in seven weeks.

$\begin{array}{c} \frac{3}{4} \text{ — } 1\frac{1}{4} \text{ —} \\ \frac{1}{2} \text{ — } 1\frac{1}{4} \text{ —} \end{array}$	$\begin{array}{c} 1 \text{ — } \frac{1}{2} \\ 1 \text{ — } \frac{1}{2} \end{array}$	$\left. \begin{array}{l} \text{Almost normal.} \\ \text{Very slight prolonged expiration} \\ \text{R.S.F.} \\ \text{Slight inspiratory crepitus R.A.}_2 \end{array} \right\}$
$\begin{array}{c} \frac{3}{4} \text{ — } 1\frac{1}{4} \text{ —} \\ 1\frac{1}{2} \end{array}$	$\begin{array}{c} 1\frac{1}{2} \text{ — } 1 \\ 2 \end{array}$	

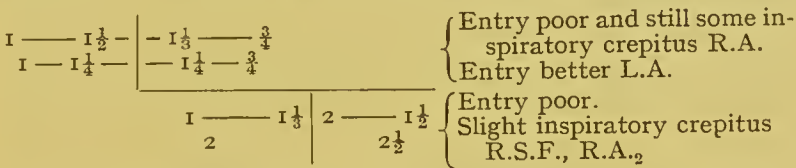
CASE 5.—Male, aged 20.—August 28th, 1912 (a patient of Dr. F. J. Lennan, of Croydon). For two or three years has

had frequent "colds, which go to his chest." Cough for the last two weeks. No hæmoptysis, dyspepsia, or night-sweats. Weight, 10 st. 13 lb. Occasional loose cough.



The patient was kept in bed for a fortnight, and practised continuous antiseptic inhalation. Smoking was forbidden.

Sept. 19th: "Getting on very well indeed—cough ceased very soon." Weight, 11 st. 3 lb. (gain of 4 lb. in three weeks).



X ray examination by Dr. Orton, Sept. 24th.—Screen: "Marked dimness on right side, especially in region of root, but quite definite all over; failure to brighten on deep inspiration. Half-inch limitation of movement of the right half of the diaphragm as compared with the left. Some slight dimness of upper part of left lung as compared with normal, but definite lightening on deep inspiration." Photograph: "Right side generally dimmer than the left, and shows some mottled shadowing, the most marked groups of shadows being in the second intercostal space in front and just below the fifth rib behind; less definite in the first space in front and just below the fourth rib behind. Shadowing on left side is somewhat indefinite, but there is a decided suspicion of mottling in the first space in front and fourth behind."

Oct. 17th, 1912: Very slight hæmoptysis a fortnight ago, but no pyrexia. Weight, 11 st. $9\frac{1}{2}$ lb. (total gain, $10\frac{1}{2}$ lb. in seven weeks). Looks and feels well. Dull areas slightly less. Very slight crepitant sound.

CASE 6.—Male, aged 25.—May 4th, 1912.—A patient of Dr. E. J. Morton, of Dulwich, who had detected evidence of tuberculosis at the left apex a week previously; the sputum was found to contain "*tubercle bacilli in moderate numbers.*" No night-sweats, and feels quite well, but has had cough since January, with "a good deal of phlegm." Smokes 3-4 oz. of

tobacco weekly. Temperature 99.8° F. at 4 p.m. yesterday, but usually 98.4°. Loose cough. Weight, 9 st. 1½ lb.

$$\begin{array}{l} \left. \begin{array}{l} 2\frac{1}{2} \text{ --- } 2\frac{1}{2} \\ 2 \text{ --- } 2 \end{array} \right| \left. \begin{array}{l} 3 \text{ --- } 2 \\ 2\frac{1}{2} \text{ --- } 1\frac{1}{2} \end{array} \right\} \begin{array}{l} \text{Poor entry.} \\ \text{Crepitus B.A. ; chiefly L.A.} \end{array} \\ \left. \begin{array}{l} 2\frac{1}{2} \text{ --- } 3\frac{1}{2} \\ 3\frac{1}{2} \end{array} \right| \left. \begin{array}{l} 3 \text{ --- } 2\frac{1}{2} \\ 3 \end{array} \right\} \begin{array}{l} \text{Loose râle, blowing expiration and} \\ \text{whisper at L.S.F.} \\ \text{Crepitus at R.S.F. and B.A.}_2 \end{array} \end{array}$$

Thus he was found to have large dull areas, with suspicion of a commencing cavity at his left upper apex. He was kept in bed for a fortnight, practised continuous antiseptic inhalation, and was ordered to abstain entirely from tobacco. May 23rd : Feels "ever so much better." Temperature usually 99° F. in the afternoon, once 100°. "Cough and phlegm less." Weight, 9 st. 6½ lb. (gain = 5 lb. in three weeks.)

$$\begin{array}{l} \left. \begin{array}{l} 2 \text{ --- } 2 \\ 1\frac{1}{2} \text{ --- } 1\frac{1}{2} \end{array} \right| \left. \begin{array}{l} 2\frac{1}{2} \text{ --- } 1\frac{1}{2} \\ 2 \text{ --- } 1\frac{1}{2} \end{array} \right\} \begin{array}{l} \text{Entry now good.} \\ \text{Slight crepitus B.A.} \end{array} \\ \left. \begin{array}{l} 1\frac{1}{2} \text{ --- } 2\frac{1}{2} \\ 2\frac{1}{2} \end{array} \right| \left. \begin{array}{l} 2 \text{ --- } 1\frac{1}{2} \\ 2\frac{1}{4} \end{array} \right\} \begin{array}{l} \text{Very slight prolonged ex-} \\ \text{piration} \\ \text{Very slight whisper} \\ \text{Very slight crepitus} \end{array} \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \begin{array}{l} \text{L.S.F.} \\ \text{R.S.F.} \\ \text{B.A.}_2 \end{array} \end{array}$$

June 20th : Weight still 9 st. 6½ lb. He had been rather careless about his inhalation, and a slight extension was found on the right side behind.

$$\begin{array}{l} \left. \begin{array}{l} 2 \text{ --- } 2 \\ 1\frac{1}{2} \text{ --- } 1\frac{1}{2} \end{array} \right| \left. \begin{array}{l} 2\frac{1}{2} \text{ --- } 1\frac{1}{2} \\ \text{--- } 2 \text{ --- } \frac{1}{2} \end{array} \right\} \begin{array}{l} \text{Poor entry.} \\ \text{Crepitus at B.A.} \end{array} \\ \left. \begin{array}{l} 1\frac{1}{2} \text{ --- } 2\frac{1}{2} \\ 2\frac{1}{2} \end{array} \right| \left. \begin{array}{l} 2\frac{1}{2} \text{ --- } 2 \\ 2\frac{1}{2} \end{array} \right\} \begin{array}{l} \text{Very poor entry.} \\ \text{Crepitus at all} \\ \text{four apices.} \end{array} \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{array}{l} \text{No prolonged} \\ \text{expiration.} \end{array} \end{array}$$

July 11th : He states that there is "a wonderful improvement this time." He has inhaled persistently since the last visit. Cough much less ; sputum scanty. Temperature now nearly always normal. Weight, 9 st. 6 lb. in lighter suit.

$$\begin{array}{l} \left. \begin{array}{l} 1\frac{1}{2} \text{ --- } 1\frac{1}{2} \\ 1\frac{1}{4} \text{ --- } 1\frac{1}{4} \end{array} \right| \left. \begin{array}{l} \text{--- } 1\frac{3}{4} \text{ --- } 1\frac{1}{4} \\ \text{--- } 1\frac{1}{4} \text{ --- } 1 \end{array} \right\} \begin{array}{l} \text{Entry better.} \\ \text{Crepitus very faint.} \end{array} \\ \left. \begin{array}{l} 1 \text{ --- } 1\frac{1}{2} \\ 1\frac{1}{2} \end{array} \right| \left. \begin{array}{l} 1\frac{7}{8} \text{ --- } 1 \\ 1\frac{3}{4} \end{array} \right\} \text{Ditto.} \end{array}$$

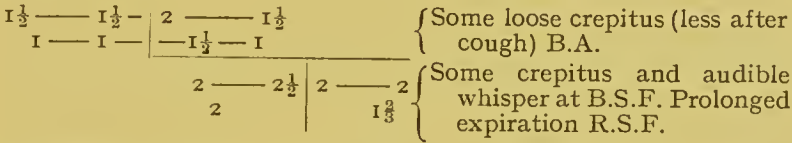
Sept. 6th : Feels "quite fit." Looks very well. Cough and sputum ceased in July, but 10 days ago there was a slight return, now better. Temperature normal. Weight now 9 st. 5 lb.

$$\begin{array}{l} \left. \begin{array}{l} 1\frac{1}{4} \text{ --- } 1\frac{1}{4} \\ 1\frac{1}{6} \text{ --- } 1\frac{1}{8} \end{array} \right| \left. \begin{array}{l} \text{--- } 1\frac{1}{2} \text{ --- } 1\frac{1}{4} \\ \text{--- } 1\frac{1}{4} \text{ --- } 1 \end{array} \right\} \begin{array}{l} \text{Only slight pleural} \\ \text{crepitus.} \end{array} \\ \left. \begin{array}{l} 1 \text{ --- } 1\frac{1}{2} \\ 1\frac{1}{3} \end{array} \right| \left. \begin{array}{l} 1\frac{3}{4} \text{ --- } \frac{3}{4} \\ 1\frac{2}{3} \end{array} \right\} \begin{array}{l} \text{Very slight prolonged} \\ \text{expiration L.S.F.} \end{array} \end{array}$$

INCREASE OF AREAS IN A SLIGHT RELAPSE 21

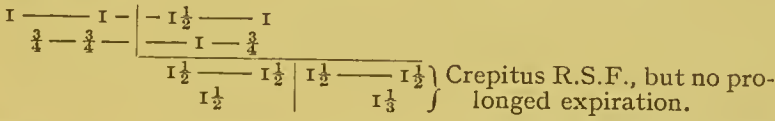
X ray examination by Dr. Orton, Oct. 1st.—“ The screen shows marked dimness of upper part of both lungs. The right side appears slightly dimmer than the left on deep inspiration. Diaphragm movements equal on the two sides (2 inches). In the photograph the right side appears generally dimmer than the left. There is extensive mottled shadowing in both lungs and exaggeration of both root-shadows. On the whole, the mottled shadowing is *more marked on the left side* than on the right, with fair uniformity, except that it is denser over the first space and second rib (corresponding to the fourth space behind), where the appearances suggest the possibility of a small cavity.”

CASE 7.—Male, aged 19.—Dec. 29th, 1910 (brought by Dr. Ashton, of Battersea). Cough for three months, some night-sweats three weeks ago. Has now a loose cough. Weight, 8 st. 1½ lb.

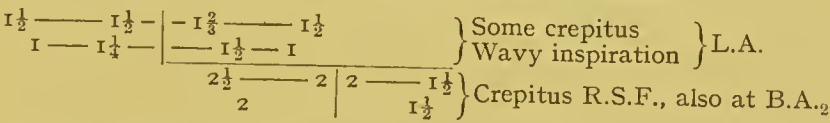


The patient was kept in bed for two weeks and practised continuous antiseptic inhalation.

Jan. 27th, 1911 : Weight, 8 st. 3 lb. (gain = 1½ lb.).

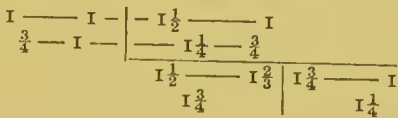


Feb 24th : The patient had taken too much time for exercise and had walked four hours a day. The result was a relapse, which showed itself in loss of weight (8 st. 2 lb.), a temperature of 100° F., and an increase in size of all his dull areas.



He was again kept in bed for two weeks, and practised persistent inhalation. The pyrexia lasted only a few days.

March 24th : Feels and looks better. Weight, 8 st. 3 lb. (has regained the lost lb.). Areas smaller.



Sept. 27th : Has done his work for three months. No cough for a month past. Weight still 8 st. 3 lb.

$$\begin{array}{c} \frac{2}{3} \text{ --- } \frac{3}{4} \text{ ---} \\ \frac{1}{2} \text{ --- } \frac{3}{4} \text{ ---} \end{array} \left| \begin{array}{c} \text{--- } 1\frac{1}{4} \text{ --- } \frac{2}{3} \\ \text{--- } 1 \text{ --- } \frac{1}{2} \end{array} \right. \\ \frac{1\frac{1}{2} \text{ --- } 1\frac{2}{3}}{1\frac{1}{2}} \left| \frac{1\frac{1}{2} \text{ --- } 1}{1\frac{1}{4}} \right.$$

On July 26th, 1912, this patient was reported to be quite well and in full work.

CASE 8.—Female, aged 30.—Jan. 25th, 1912 (a patient of Dr. Pedler, of Knightsbridge). More or less cough for several years. Some night-sweats and much weakness more than a year ago, but she had made a great effort to remain at her work. Night-sweats three or four times a week for the last three months. Weight, 8 st. 7½ lb. (last August she weighed 9 st. 7 lb.). Frequent short cough.

$$\begin{array}{c} 2 \text{ --- } 2\frac{1}{2} \\ 1\frac{1}{2} \text{ --- } 1\frac{3}{4} \end{array} \left| \begin{array}{c} 2 \text{ --- } 1\frac{1}{2} \\ \text{--- } 1\frac{1}{2} \text{ --- } 1\frac{1}{3} \end{array} \right. \left\{ \begin{array}{l} \text{Poor entry B.A.} \\ \text{Moist crepitus and prolonged expiration R.A.} \\ \text{Slight crepitus L.A.} \end{array} \right. \\ \frac{2 \text{ --- } 2\frac{1}{2}}{2\frac{1}{2}} \left| \frac{3 \text{ --- } 2\frac{1}{2}}{3} \right. \left\{ \begin{array}{l} \text{Entry almost absent B.S.F. and B.A.}_2 \\ \text{Faint crepitus R.S.F.} \end{array} \right.$$

Dr. Pedler reported that “*the bacillus is present in fair numbers.*” The patient was kept in bed for a fortnight, and practised continuous antiseptic inhalation.

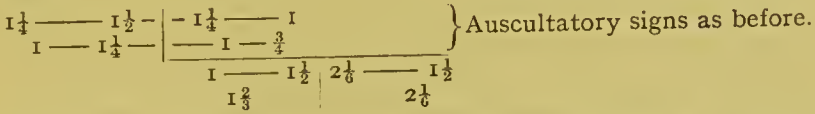
Feb. 16th : Feels able to take longer breaths. Temperature 99.2° to 99.8° F. in the evening (once it rose to 100°, once even to 104.2°). Weight, 8 st. 12 lb. (gain = 4½ lb. in three weeks). Cough much better.

$$\begin{array}{c} 1\frac{1}{2} \text{ --- } 2 \\ 1\frac{1}{4} \text{ --- } 1\frac{1}{2} \end{array} \left| \begin{array}{c} \text{--- } 1\frac{3}{4} \text{ --- } 2 \\ \text{--- } 1\frac{1}{4} \text{ --- } 1 \end{array} \right. \left\{ \begin{array}{l} \text{Entry better.} \\ \text{Some prolonged expiration and crepitus R.A.;} \\ \text{less at L.A.} \end{array} \right. \\ \frac{1\frac{1}{2} \text{ --- } 2}{2} \left| \frac{2\frac{1}{2} \text{ --- } 2}{2\frac{1}{2}} \right. \left\{ \begin{array}{l} \text{Entry much better, but still poor} \\ \text{at R.S.F., with some prolonged} \\ \text{expiration. Distinct crepitus} \\ \text{B.A.}_2 \end{array} \right.$$

March 15th : Feels “ever so much better—no comparison” ! Cough much better. Sputum “less than half of what it was.” Temperature has been not above 98.6° since Feb. 16th. Weight, 9 st. 3 lb. (total gain = 9½ lb. in seven weeks).

$$\begin{array}{c} 1\frac{1}{4} \text{ --- } 1\frac{2}{3} \text{ ---} \\ 1 \text{ --- } 1\frac{1}{4} \end{array} \left| \begin{array}{c} \text{--- } 1\frac{1}{2} \text{ --- } 1\frac{1}{4} \\ \text{--- } 1\frac{1}{4} \text{ --- } 1 \end{array} \right. \left\{ \begin{array}{l} \text{Double moist crepitus} \\ \text{Slight prolonged expira-} \\ \text{tion} \end{array} \right\} \text{R.A.} \\ \frac{1\frac{1}{2} \text{ --- } 1\frac{3}{4}}{2} \left| \frac{2\frac{1}{4} \text{ --- } 1\frac{1}{2}}{2\frac{1}{4}} \right. \left\{ \begin{array}{l} \text{Ditto at R.S.F.} \\ \text{Poor entry and slight crepitus} \\ \text{B.A.}_2 \end{array} \right.$$

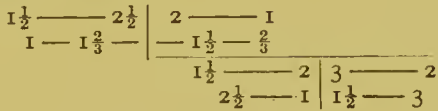
April 25th: Weight, 9 st. 10 lb. (total gain = 16½ lb. in 13 weeks).



Thus far the patient had made remarkable progress. Unfortunately, her surroundings were now unsatisfactory, and she was the subject of much mental anxiety. The result was a loss of weight, and more definite signs of cavity at her right apex. After some weeks she obtained admission into a sanatorium, where she was allowed to continue her antiseptic inhalation.

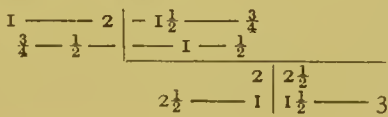
[It has seemed desirable to add to the above records a few observations of percussion-results and X ray findings in children of school age. By kind permission of Dr. Voelcker, Dr. Ironside Bruce investigated by X rays three cases from the Hospital for Sick Children, Great Ormond Street, in whom I had detected what appeared to me to be percussion evidence of present or past tuberculosis of lungs and bronchial glands.]

CASE 9.—Flora L., aged 11.



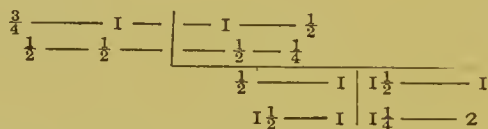
X ray report by Dr. Ironside Bruce.—"Screen: Some general increased opacity of right lung, which is more definite and discrete at the root, and extends towards the apex and the base. Diaphragm movements equal. Right diaphragm flattened. Radiograph: Increased opacity of both lungs is observable, which is made up of fine striations, the right lung being particularly involved. In addition, throughout both lungs, *small rounded opacities arranged in groups* are observable, which are more numerous though less opaque and less sharply defined at the right base and apex."

CASE 10.—Violet J., aged 10.



X ray report by Dr. Ironside Bruce.—"Screen: Some general increased opacity of the right lung more marked towards the root; extends towards base and apex, most marked towards the apex (second interspace). Left root shows some increased opacity. Diaphragm movements normal and equal. Radiograph: Both lungs show opacity, most markedly the right, and towards both roots. The increased opacity is made up of coarse and fine striations, but also is due to *rounded opacities arranged in groups*. These latter abnormalities are more numerous throughout the right lung, and particularly the right base, but also are present on the left, the apex being principally affected."

CASE II.—Frank P., aged 9.



X ray report by Dr. Ironside Bruce.—"Screen: Increased opacity of root of right lung, extending more markedly towards the base, but also to some extent towards the apex. Left lung shows nothing abnormal. Right diaphragm, limited movement: left, normal. Radiograph: both lungs show a considerable degree of increased opacity, which is largely coarsely striated in arrangement, but is also made up of fine striations. On the right the whole lung is involved, there being present, in addition to the striated opacity, *small rounded areas arranged in groups* distributed throughout the whole lung, but most numerous at the base and at the level of the second interspace. On the left, the increased opacity is made up of coarse striations, which occur at the root and towards the apex. In the latter situation a *few small rounded opacities* are present."

These cases are sufficient to prove that it is easy to measure the size of the six typical dull areas at the four apices in incipient pulmonary tuberculosis with sufficient accuracy to give a very valuable guide to diagnosis and to prognosis. The practitioner will soon find the advantage which he will derive from a careful observation of them. He will do well at first to confine his attention to these six areas, for the complete localisation of an incipient

pulmonary tuberculosis is much more extensive and complicated. So far as I know, it has never been described in detail, and it is therefore necessary to point out the many

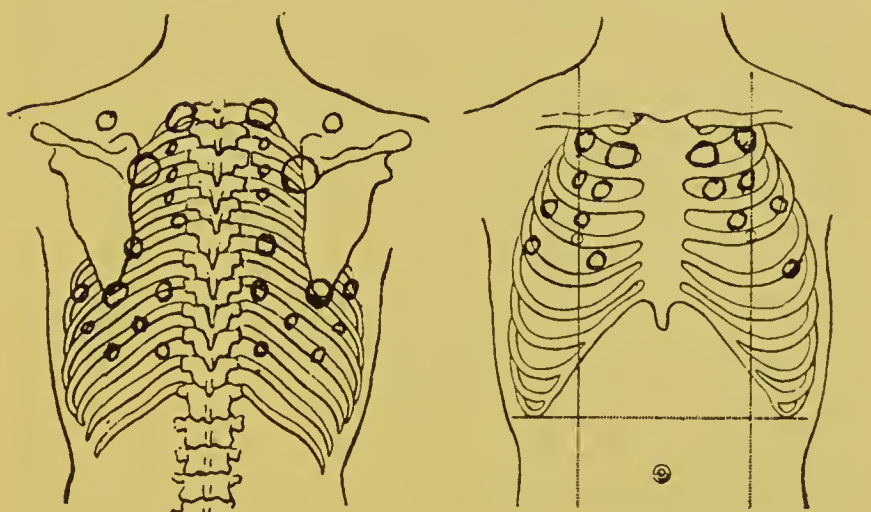


Diagram showing the distribution of the dull areas in incipient pulmonary tuberculosis.

other positions on the chest wall where small dull areas may be detected in an early case, in addition to the six already described. (See Figure.)

Other Dull Areas.

On the anterior wall of the chest a small dull area can always be discovered by careful percussion in the third intercostal space on each side, above the nipple or somewhat more internally; and further out in the same space there is on each side a dull area below the anterior fold of the axilla. On the right side, internal to and below the nipple (in the region of the middle lobe of the right lung), there is a very definite dull area, with resonance between it and the border of the right auricle (which normally extends a fingerbreadth outwards into the fourth space, and in these cases of early pulmonary tuberculosis sometimes as much as a fingerbreadth and a half). Nothing corresponding to this area can be detected on the left side, for in this position there is the dullness due to the heart. But on

both sides there is a small dull area in the anterior part of the axilla at about the level of the fourth space or fifth rib. Posteriorly, there is always a dull area at the angle of the scapula on each side, and another a little externally, in the posterior axillary region. When the infection in this region extends to the surface of the lung and sets up a local pleurisy, as is not uncommon, these two areas unite into one, especially if any pleural effusion occurs. If the patient improves and the effusion is absorbed the dullness diminishes, and the two separate areas can again be distinguished. But if the pleural effusion increases it may produce a large area of dullness, with defect of air-entry, vocal resonance, and vocal fremitus.

If the horizontal line through these two areas be prolonged towards the spine a third area is met with on each side near, but not close to, the spine. These areas also are very constant. At a slightly higher level there is an interesting difference between the two sides, for on the left side a dull area is found at the posterior edge of the scapula, about two fingerbreadths above the angle, while on the right side the position of the corresponding area is not at the scapular edge, but always nearer to the spinal column, in about the sixth space. This is a remarkable and invariable difference, which evidently depends on the different anatomical division of the lungs into three lobes on the right side and two on the left. Furthermore, in the upper part of the back on each side three small separate dull areas can often be detected in the positions shown on the diagram, and below the angle of the scapula there are also several dull areas detectable in positions which are arranged in a kind of regular pattern, and are marked on the diagram.

This remarkable grouping of small dull areas may usually be detected by careful percussion in quite early cases of pulmonary tuberculosis. Their relative positions are practically invariable. From their scattered and symmetrical distribution and from the slight differences between the two lungs which I have described, it seems

clear that they must correspond to the ultimate distribution of the bronchial tubes in their most direct course. The dullness and lessened air entry are probably caused by multiple local centres of infection giving rise to local collapse, followed by local broncho-pneumonia of a very chronic type, and finally fibrosis.

Of these dull areas the largest are always the six at the apices, as previously described. For the apical region is the least expanded in ordinary respiration, and in a tuberculous infection of the lung (especially if it at all implicates the pleura) there appears to be a reflex inhibition of respiration, just as the diaphragm movements are checked by even a local peritonitis. In an early stage of pulmonary tuberculosis the fluorescent screen will often show a marked limitation of the inspiratory movement of the diaphragm, sometimes unequally on the two sides. There can, I think, be no doubt that a similar reflex inhibition of the other inspiratory muscles is common in pulmonary tuberculosis. Every physician must have observed how difficult it is to induce such patients to take a long deep breath and thoroughly to expand the chest. This failure of expansion in its turn makes the local conditions more favourable for the development of the tubercle bacillus—another instance of a “vicious circle” in disease. Thus the morbid process develops more rapidly in the apical areas, and these areas are the most prone to soften down into irregular cavities.

Results of X Ray Examination.

It is important to ascertain whether the results obtained by percussion in incipient pulmonary tuberculosis are or are not confirmed by X ray examination of the chest.

“Segnius irritant animum demissa per aurem
Quam quae sunt oculis subjecta fidelibus.”

“ὦτα γὰρ τυγχάνει ἀνθρώποισι ἐόντα ἀπιστότερα ὀφθαλμῶν.”

I have been able to make some comparative observations on this point through the kindness of my friend and

colleague Dr. Harrison Orton, medical officer in charge of the X ray Department at St. Mary's Hospital, and honorary secretary of the Electro-Therapeutical Section of the Royal Society of Medicine, the excellence of whose work in this department is well known. The results obtained by the X ray examination in the cases quoted are given in Dr. Orton's own words. By comparing these results with the percussion results we find that the X ray examination (1) confirms the existence of morbid changes in the lungs in each case ; (2) confirms the statement as to which lung was the more affected ; (3) confirms, in the more affected lung, the localisation in the upper intercostal spaces ; (4) shows in the less affected lung either nothing definite, or very slight changes, in the upper part of the lung ; and (5) reveals opaque areas about the root of the lung which are inaccessible to percussion. Thus the radiographic examination gives a confirmation of the percussion results which is complete up to a certain point, and which is very welcome. It does not, indeed, reveal quite so much of the early changes as may be ascertained by careful percussion, but it seems to be capable of showing the existence of some morbid condition in any case where the percussion evidence is positive, though slight. It is therefore most useful, provided that the examination be made by a skilled expert, employing all the most recent advances in "technique." In one respect the X ray examination has a decided superiority to percussion, for it can reveal changes about the root of the lungs, opaque areas and radiating lines due in all probability to chronic morbid changes in root-glands and to peribronchial and perivascular fibrous thickening. Yet these chronic changes may in any case be possibly very old, absolutely quiescent, and may form no part of the really active morbid process. All who have worked in a hospital for children know how very frequently the tracheal and bronchial glands are found to be caseous even in an autopsy which shows little or no other evidence of tubercle. If such children had survived they would probably have had

to their dying day fibrous glandular relics which could be shown by the X rays.

Dr. A. C. Jordan, of Guy's Hospital, has recently¹ pointed out the extreme frequency of chronic tuberculous changes in glands at the root of lungs passed as "healthy" in the post-mortem room. He states that in 25 such cases out of 36 "there were gross deposits of calcareous matter in the bronchial glands or elsewhere; in the rest there were small calcareous fragments, and in many there was a large excess of fibrous tissue arranged in thick strands or sheaths around the main branches of the bronchi." Sections showed typical tuberculous bronchopneumonic patches with small round cells and large endothelioid plates, extensive tracts of dense fibrous tissue, and calcareous patches. But the very fact of the commonness of such changes in connection with lungs which are found to be practically healthy on autopsy shows how easy it is to attach too much importance to the "root-shadows" and to the radiating lines indicating the position of thickened bronchial tubes and blood-vessels, and how readily even a skilled X ray examination may mislead. We should naturally expect that these fibrous and calcareous masses would be specially opaque to the X rays, and would therefore be specially prominent in the radiograph, whereas the commencing areas of tuberculous infiltration of the finest bronchial tubes and alveoli would be much more transparent, and would show in early cases only a fine "mottling," the true significance and importance of which might be easily overlooked.

In examining an X ray photograph of the thoracic organs to detect indications of such mottling and to compare the exact position of such indications with the results obtained by percussion, it is necessary to bear in mind that in such a photograph the anterior intercostal spaces are projected on to the posterior, in such a way as greatly to confuse the picture. Much care is required to disentangle them. Thus in Case 1 above, the mottling

¹ *Brit. Med. Jour.*, August 31st, 1912.

was found in a position corresponding to the first and second spaces in front and the fourth and fifth spaces behind. Similarly in Case 2 the mottling was found in the first space in front corresponding to the fourth space behind, and in the second anteriorly and fifth posteriorly, while another area in the third space in front corresponded to the seventh rib behind. Thus the large dull area found by percussion over the upper part of the lower lobe and situated at about the fourth rib posteriorly is confused in the radiograph with the areas in the first and second spaces anteriorly, which are due to foci of infection in the upper lobe. And the effect of this projection varies according to the angle which the photographic plate makes with the patient's chest wall when the negative is taken, which will be different in well-developed chests from what it is when the chest is ill-developed.

Hence it is clear that very great care is required in the interpretation of the radiographic picture. It shows much which is probably of little present importance, it shows less distinctly the earliest indications of active mischief, which may be more distinctly detected by careful percussion, and it confuses the localisation. Further advance in technical skill will, no doubt, minimise these difficulties, yet it will remain true that the highest expert opinion in the matter will be necessary for trustworthy conclusions, and that this will naturally involve expense. On the other hand, it is also true that percussion must be at its best if it is to be superior to the X rays, and that the inadequate attention at present given to this method of examination by most practitioners of medicine is the cause of a very large amount of failure in diagnosis. A practitioner who does not feel able to rely on his own percussion will do well to obtain an X ray picture taken and interpreted by an expert. But a practitioner who has learned to trust his own percussion does not need radiography to enable him to arrive at a sound conclusion.

Pathological Process.

It is clear from the percussion results already stated in this lecture, and from the X ray findings which confirm them, that an incipient pulmonary tuberculosis consists in the carriage of tubercle bacilli, almost certainly by inhalation, to the finest bronchial tubes and alveoli in areas scattered freely over the lungs, followed by morbid changes which advance more rapidly in the upper part of both upper and lower lobes. From these infected areas the morbid process advances along the lymphatic sheaths of the bronchial tubes and of the blood-vessels till it reaches the glands—pulmonary, bronchial, and tracheal. It seems to be possible in young children for the bacilli to make their way to these glands without any apparent implication of the pulmonary tissue. Probably this is due to the greater freedom and activity of the lymphatic circulation in early childhood.

An examination of the post-mortem records of the Hospital for Sick Children, Great Ormond Street, shows that in the majority of children dying from tuberculosis the chief seat of the infection is in the bronchial and tracheal glands and in the lungs. This infection is often extremely virulent, the glands being greatly enlarged, caseous, and often breaking down; frequently they involve the pulmonary tissue by contiguity or by rupture into a bronchus. (The lower lobe of the right lung is specially prone to suffer in this way.) An acute miliary tuberculosis of the lungs is a frequent result. Even in very young subjects cavities are not rare. When the process is more chronic an implication of the apices of the lungs resembling that found in adults may occur. In this group of cases the implication of the cervical glands is usually much less marked, while the mesenteric glands are often normal. In a smaller number of cases the implication of the bronchial and tracheal glands and of the lungs may be very slight or even absent, while the cervical glands, and still more frequently the mesenteric glands, are caseous. But even these may be but little

affected while the peritoneum is crowded with tubercles, as if the bacilli made their way through the intestinal wall, leaving little or no trace of their passage, just as happens in the lungs.

The first group of cases are almost certainly due to inhalation of bacilli of the "human type," while in the second group the infection appears to enter by the alimentary canal. Probably these are often due to the "bovine" bacillus.

In adults the local chronic tuberculous changes in the lungs are much more commonly observed than in children, and the implication of the glands is much less marked and much less virulent. Also the spread of tuberculosis along the lymphatic sheaths of the blood-vessels until the cerebral meninges are attacked is much less common in adults than in children. But both in children and in adults the disease begins, not at the root of the lung, but in the finest bronchial tubes and in the alveoli, in scattered areas which show a characteristic localisation.

To sum up this long discussion, I would claim that the first of my two questions may now be answered in the affirmative. It is possible for any general practitioner of medicine, by the adoption of a correct method of examination and the exercise of a little care and patience, accurately to diagnose the existence of an incipient pulmonary tuberculosis long before any bacteriological evidence can be obtained. It is not necessary for him to wait for a positive bacteriological report, and he will be foolish indeed if he allows a negative report to shake a diagnosis which is founded on an accurate physical examination. The possibility of a correct diagnosis is, in more senses than one, *in his own hands*.

II.—THE TREATMENT OF INCIPIENT PULMONARY TUBERCULOSIS.

In the minds of the majority of the medical profession the question as to the proper treatment of pulmonary tuberculosis seems to be answered by the one word "sanatorium," to which some are now inclined to add (relying on the confident assertions of its advocates) the word "tuberculin." But with regard to the employment of tuberculin there is still acute controversy as to whether it ought to be employed in small or in large doses, whether the grave symptoms which may follow its employment are due to it or to "mixed infection," and whether it ought to be used only when the patient is kept at rest and under skilled supervision, or may be given to patients who are allowed to pursue their ordinary occupations.

It is quite certain that sanatoria have been extremely useful, and that by their help many patients have been restored to health. Yet it must also be sorrowfully confessed that many patients who have lived in a sanatorium for six months, at a very considerable cost, are still not completely cured, and that numerous instances of subsequent relapse occur, so that in the minds of many practitioners there is a growing scepticism as to the curative value of sanatoria. And when we consider the matter carefully we see that though the treatment by absolute rest, abundance of fresh air, and abundance of nutriment places the patient under the most favourable circumstances for fighting his battle with the invading bacilli, *it does not include any organised attack on the bacilli themselves.* It is the consciousness of this that has led many to desire to make trial of tuberculin. But is there no simpler and less dangerous method of direct attack? Is it quite certain that ordinary antiseptic drugs are of no value in the treatment of pulmonary tuberculosis? On the contrary, it is quite certain that some cases have markedly improved under the use of large doses of creosote. Of late the value of injections of a preparation of which iodine

appears to be the active agent has been prominently advocated in France. And a letter in the *British Medical Journal* from a practitioner who had been using tuberculin and whose supply was exhausted related that he had substituted injections of carbolic acid and had obtained better results. But creosote by the mouth is apt to cause much disturbance of the organs of digestion, while hypodermic injections are apt to be painful, and require the most scrupulous precautions against sepsis.

Treatment by Continuous Inhalation of Antiseptic Vapours.

Why not administer these antiseptic drugs by a method of inhalation? Too many physicians reply, "Because we cannot see how such a method can be of service." Some even go so far as to say, "Because it cannot possibly do any good." But is such scepticism justifiable? If a patient inhales a combination of antiseptic vapours *persistently*, day and night (except when actually taking food), by the principle of diffusion of gases the antiseptics *must* make their way into the pulmonary alveoli, if the inhaler be worn for a sufficient length of time. This is surely indisputable. And if antiseptic drugs like creosote, carbolic acid, and iodine are dissolved in alcohol, ether, and chloroform, there must be a gradual absorption of these anæsthetic agents into the blood, for this is an A.C.E. mixture, and we know that if used in greater strength it would prove the absorption by producing general anæsthesia. The slow absorption of these agents in a very dilute condition must carry with them into the blood the antiseptics dissolved in them. How these may be transformed in the blood it is for physiological chemistry to determine, but it seems likely that some antiseptic influences will thus be carried by the blood-stream to the tuberculous foci, which will then be attacked both from without the lungs and from within.

Certain other properties of this combination of drugs deserve attention. First, with regard to the alcohol, we have learned from the remarkable observations of Pro-

fessor Collingwood and Dr. W. H. Willcox how much the stimulating and tonic effect of oxygen given by inhalation is increased by passing the oxygen through absolute alcohol. Dr. Willcox has calculated the amount of alcohol absorbed and finds it to be very small, yet it exercises a most remarkable influence, as has subsequently been proved by administering oxygen bubbled through alcohol in cases of cardiac failure. The effect of the continuous inhalation of an antiseptic mixture in which alcohol is the solvent must therefore be a tonic and stimulating influence constantly at work. Another constituent of the mixture, ether, will act similarly and perhaps more strongly. Lastly, chloroform has a sedative influence and strongly tends to diminish cough. I therefore recommend, and have constantly employed, the following formula for a solution to be used for continuous antiseptic inhalation.

℞	Creosoti	-	-	-	-	ȳii	}	= ȳi
	Acidi Carbolici	-	-	-	-	ȳii		
	Tinct. Iodi	-	-	-	-	ȳi		
	Sp. Ætheris	-	-	-	-	ȳi		
	Sp. Chlorof.	-	-	-	-	ȳii		

Menthol and formalin appear to me too irritating, and unsuitable for continuous inhalation.

Whether my argument from theoretical considerations does or does not produce conviction in the minds of my hearers, the final appeal must be to the results of experience. If the results of experience can be shown to be satisfactory, theoretical objections will soon be swept away. For we must always remember that however fascinating a scientific or apparently scientific basis for treatment may be, our most trusted remedies are the product of empirical observation. Quinine, opium, digitalis, mercury, and sodium salicylate are triumphs of empiricism. Medicine is both a science and an art; both must be cultivated with equal care and accuracy. For the art to ignore the science is stupid; for the science to neglect the art is suicidal. The medical science which has any real claim to the name cannot be confined to the

laboratory and its products ; it must be constantly in touch with an ever-increasing accuracy of clinical investigation. The results of treatment which claims to be " scientific " must be tested, not simply by the assertion of the patient that he is " better " (have we not all heard of the *spes phthisica* ?), but by diminution of pyrexia, of cough, and of sputum, by increase in weight, and by careful observation and record of the physical signs. I therefore ask your careful consideration of the results recorded in the table of 70 cases treated with the formula above stated (pp. 37-41) which have been already published in the medical journals.¹ The most recent of these cases ceased treatment a year ago. The table shows in each case : (1) the gain in weight during the first three weeks ; (2) the total gain in weight ; (3) the effect on the cough ; (4) the effect on the sputum ; (5) the effect on the physical signs ; and (6) the result as to permanent capacity for work. The present condition of each case in October, 1912, with very few exceptions, has been ascertained by letters directed to the patient or to the medical man who sent him. The answers have been pleasant reading, for they have shown the most satisfactory results in nearly all cases, and they have been full of gratitude. Out of the 70 cases published there are :

Complete recoveries	-	-	-	-	48
Probably complete recoveries	-	-	-	-	3
					—51
Cases incompletely cured	-	-	-	-	10
Final result not known	-	-	-	-	2
Died	-	-	-	-	7
					—
Total	-	-	-	-	70

Of the 10 incompletely cured, 9 have improved remarkably ; 1 has deteriorated. Of the 7 deaths, 1 was due to apoplexy after recovery from the lung disease, 1 was hopeless when first seen, 2 abandoned treatment, 1 died from hæmoptysis, 1 from abdominal tuberculosis, and 1 from tuberculous meningitis.

¹ Cases 1-30 in *British Medical Journal*, Dec. 11th, 1909 ; Cases 31-50 in *The Lancet*, Nov. 19th, 1910 ; Cases 51-70 in *British Medical Journal*, April 6th, 1912.

TABLE GIVING SEVENTY CASES OF PULMONARY TUBERCULOSIS TREATED BY CONTINUOUS ANTISEPTIC INHALATION.

Number.	Sex and years of age.	Stage when first seen.	Lungs.	Tubercle bacilli.	Gain in weight in pounds.		Cough.	Sputum.	Physical signs.	Result (October, 1912).
					First weeks.	Total.				
1	F., 19	Early, acute.	L. more than R.	—	Loss.	20	—	None.	Rapid improvement.	Recovery. No further information (hospital case). Quite well, and in active work for 5 years.
2	M., 33	Early.	"	Many.	—	30	Rapid diminution.	"	"	Quite well, and in active work for 5 years.
3	M., 34	Very acute, after removal of caseous cervical glands.	R. more than L.	None, but many streptococci.	—	52	"	"	Early formation of basic cavity followed by rapid improvement.	Quite well, and in active work for 5 years.
4	M., 33	Incipient.	"	—	—	14	"	"	Rapid improvement.	Quite well, and in active work for 5 years.
5	M., 13	"	L. more than R.	—	4	23	None after a few days.	None after a few days.	"	Quite well, and in active work for 5 years.
6	F.	"	"	—	3½	8½	Slight.	None.	"	Well, though not robust; in active work for 4½ years.
7	F.	"	R. more than L.	—	2½	30	"	"	"	Quite well, and in active work for 4½ years.
8	F., 28	"	L. more than R.	—	Nil.	1	"	"	"	Quite well 2½ years later. No further information.
9	M., 50	Incipient (H.).	R. more than L.	—	—	—	"	Slight (H.).	"	Quite well, and in active work for 4½ years.
10	F., 39	Chronic (cavity).	L. more than R.	—	4	12	Much less.	Much less.	Gradual improvement.	Quite well, and in active work for 4½ years (had a course of tuberculin treatment later).
11	F., 17	Early.	R. more than L.	—	—	6+	Slight.	None.	Improved. Slight relapse later.	2 months later "much better." No further information.
12	M., 25	"	"	None.	2½	9½	Ceased in 1 week.	Slight.	Steady improvement.	Quite well, and in active work for 4½ years.

TABLE GIVING SEVENTY CASES OF PULMONARY TUBERCULOSIS TREATED BY CONTINUOUS ANTISEPTIC INHALATION (continued).

Number.	Sex and years of age.	Stage when first seen.	Lungs.	Tubercle bacilli.	Gain in weight in pounds.		Cough.	Sputum.	Physical signs.	Result (October, 1912).
					First 3 weeks.	Total.				
13	M., 36	Incipient.	L. more than R.	None.	—	5	—	Scanty.	Rapid improvement.	Quite well, and in active work for 4 years.
14	M., 19	Early (H.).	R. more than L.	—	Slight.	1	Slight.	Slight. (H.).	"	Well, and at work for 2 years. Not seen again. Died 15 months ago.
15	M., 15	Early.	"	—	Lost in 2 weeks.	7	Lost in 2 weeks.	Scanty.	"	Quite well. In Australia 2 years. At work 1 year.
16	M., 20	"	"	—	None.	—	None.	None.	Slight but definite improvement.	Quite well, and in active work for 4 years.
17	M., 26	Chronic (cavity).	"	—	Rapidly lessened.	—	18½	None.	Steady improvement.	Very great improvement but still a cavity when last seen 2½ years ago.
18	M., 40	Early (H.).	"	—	Slight.	3½	8½	None.	Rapid improvement.	Quite well, and in full work for 3 years.
19	F., 18	Incipient.	L. more than R.	—	Slight.	—	2½	None.	"	"
20	F., 22	"	"	—	Rapidly improved.	2	6	Slight.	"	Quite well—married and in "splendid health"—3 years.
21	M., 36	Early (H.).	R. more than L.	Present.	Rapid improvement	Lost 10. ½	29	Rapid improvement	"	Quite well, and in full work—3 years.
22	M., 38	Incipient.	"	—	Vanished in 1 week.	4	9	None.	"	"
23	M., 32	Early, acute (H.). (four cavities).	"	Many.	Improved rapidly.	—	19	Scanty.	Four cavities gradually healed (had some tuberculin injections later).	"
24	F., 13	Early.	L. more than R.	None.	—	—	25	"	Rapid improvement.	"
25	M., 37	Early (cavity).	R. more than L.	—	—	5½	27	None.	Rapid improvement (cure of cavity).	"

26	M., 42	Incipient (H.).	L. more than R.	—	9	26	Slight.	Slight.	Rapid improvement.	Quite well, and in full work—3 years.
27	F., 34	Early (H.) (cavity).	R. more than L.	—	—	3½	Soon lost.	None.	Slow but steady improvement (cavity healed).	Fairly well, and does her housework—3 years.
28	M., 9	Early.	"	—	—	7	Improved.	Improved.	Gradual but complete recovery.	Well; at school—3 years.
29	M., 28	Early (cavity).	"	—	7	14	"	"	Improvement delayed by foul teeth.	Quite well, and in full work—3 years.
30	M., 30	Early, acute (cavity) (H.).	"	—	—	21	Rapid improvement.	Rapid improvement.	Rapid improvement (cure of cavity).	" " 2½ "
31	M., 69	Early (H.) and pneumothorax chronic alcoholism;	L. more than R.	—	—	—	Used in haler for 6 weeks and improved rapidly.	Used in haler for 6 weeks and improved rapidly.		" " 2 "
32	M., 38	Incipient (with malaria)	L. more than R.	Note.	—	9	Slight.	Slight.	Steady improvement.	Well, and in full work—2½ years.
33	M., 39	Late (H.).	R. more than L.	—	—	Loss 3 lb.	Less.	Less.	Gradual improvement.	Improved. No H. or pyrexia for 18 months.
34	M., 30	Late (H.).	L. more than R.	—	—	7	"	"	Steady improvement.	" In good health and able to do my work.
35	F., 31	Chronic (with colitis).	R. more than L.	—	—	7½	"	"	Slow improvement.	Wintered in Switzerland; came back worse. Since then, slow deterioration.
36	F., 53	Chronic.	"	—	—	9	"	"	Definite improvement.	Recovered. Died 8 months later from apoplexy.
37	F., 28	Very late.	L. more than R.	*	—	—	Less.	Less.	Distinct temporary improvement.	Remarkable improvement for 6 months. Died after 1 year. Post-mortem; only lower half of right lung capable of function.
38	F., 23	Incipient.	R. more than L.	—	3	8½	Ceased in 1 week.	Slight.	Rapid improvement.	Well, and did full work (now married)—2 years.
39	M., 29	"	"	—	6½	—	Ceased quickly.	None.	"	Well, and did full work—2 years.
40	M., 47	Early, acute (with nervous prostration).	R. equals L.	—	—	9½	Rapid improvement.	Rapid improvement.	Slow improvement.	Complete recovery of lungs. Gradual recovery from the nervous weakness.
41	M., 23	Early (H.).	R. more than L.	Present.	—	4½	Soon ceased.	Soon ceased.	Rapid improvement.	Has now resumed clerical work.
42	F., 35	Incipient with (hay-fever).	"	—	4	9	"	"	Distinct improvement.	Quite well, and in full work—2 years.

* Had been treated with tuberculin injections weekly for six months.

" General health excellent." Still gaining weight, but temperature still 99.4° F. in afternoon.

TABLE GIVING SEVENTY CASES OF PULMONARY TUBERCULOSIS TREATED BY CONTINUOUS ANTISEPTIC INHALATION (continued).

Number.	Sex and years of age.	Stage when first seen.	Lungs.	Tubercle bacilli.	Gain in weight in pounds.		Cough.	Sputum.	Physical signs.	Result (October, 1912).
					First 3 weeks.	Total.				
43	F., 31	Early.	R. more than L.	—	2	6½	Less.	Less.	Definite improvement.	Died a year later. "Quite intractable, and went her own way in defiance of all advice." Relapsed. Died (hemoptysis) a year later. Quite well, and at school—2 years.
44	M., 28	"	"	Many.	—	14½	Much less.	Much less.	Rapid improvement.	No reply to inquiry (probably traveling).
45	M., 6	Incipient.	L. more than R.	None.	—	—	Lost in 10 days.	None.	Distinct improvement.	Afterwards, psoas abscess and spinal caries, which were cured by surgical treatment. Mr. Warren Low reports him now as "perfectly well, with a stiff knee."
46	F., 30	Early.	R. more than L.	"	6	10	Rapidly lessened.	Lessened.	Rapid improvement.	Much improved. Able to work. No cough or pyrexia. Still has cavities. Quite well, and in full work—2 years.
47	M., 21	Early (with tuberculous arthritis of knee.)	R. equals L.	—	—	—	Rapid relief.	Soon lessened.	Rapid recovery of lungs. Gradual covey of knee.	"Has done well and increased her weight, but tubercle bacilli still present and some moist sounds. Died a year later from tuberculous meningitis."
48	M., 29	Chronic (3 or 4 cavities).	L. more than R.	—	—	12	"	"	Steady improvement.	"I have been better this year than last." Looks and feels well. Still a chronic cavity.
49	F., 26	Early.	R. more than L.	Present.	5	16	"	"	Rapid improvement.	
50	F., 22	"	"	"	—	—	"	"	Steady improvement.	
51	M., 26	Late (cavities)	L. more than R.	—	Loss 1 lb.	Loss.	"Very much less."	"Very much less."	Temporary improvement though method used imperfectly.	
52	M., 25	Chronic (cavities).	"	—	—	14	Much less.	Much less.	Marked improvement though method used imperfectly.	

53	M., 52	Incipient.	L. more than R.	Present.	—	21	Soon ceased.	Slight.	Rapid improvement.	Quite well, and in full work—1½ years.
54	M., 33	Early (H.).	"	—	1½	28	Improvement for 7 weeks; then haemoptysis; then steady improve- ment.	Gradual improvement.	Gradual improve- ment.	Well, and in full work—1½ years.
55	M., 52	Incipient (with mitral steno- sis).	R. more than L.	—	5	12½	Ceased at once.	Slight.	Rapid improvement.	Quite well, and in full work—1½ years.
56	F.	Early (X ray) (2 months in sanatorium).	L. more than R.	None.	3	8	Almost none.	Very slight.	"	Well, and fully occupied—1½ years.
57	M., 23	Early (H.).	R. more than L.	Present.	5	7½	Ceased at once.	Slight.	Gradual improvement.	Large hæmorrhage 7 months later. Again recovered and gained weight. Now working 5 hours a day, and "holding his own."
58	M., 19	Incipient.	L. more than R.	—	1½	1½	Much better.	Scanty.	Rapid improvement.	Quite well, and in full work—1½ years.
59	M., 44	"	R. more than L.	—	6	6	Soon ceased.	Soon ceased.	Distinct improvement.	Recovery of lungs. Apoplectic attack 11 months later, followed by right hemiplegia.
60	F., 29	"	"	—	4	6	"	"	Rapid improvement.	Quite well, and in full work—1½ years.
61	F., 27	"	"	—	—	3½	"	"	"	"
62	M., 19	"	"	Many.	5	11	"	"	"	"
63	F., 13	Early (with abdominal tuberculosis).	"	—	—	—	"	"	Distinct improvement.	Relapsed and <i>died</i> six months later.
64	F., 45	Incipient.	"	—	6	6	"	"	Rapid improvement.	Quite well, and in full work—1½ years.
65	M., 22	"	R. more than L.	None	3	3½	"	"	"	Well, and in full work—1½ years.
66	M., 17	"	"	—	—	14	"	"	"	Well, at school—1½ years.
67	F., 26	"	"	—	—	13	"	"	"	Quite well. Since married and one child.
68	F., 22	"	"	—	—	2½	"	"	"	Quite well and fully occupied—1½ years.
69	F., 39	Early (small cavity) and asthma.	"	—	1	4	Rapidly improved.	"	"	Still has asthma, but can do her household work.
70	F.,	Incipient.	"	—	5	8	Soon ceased.	None.	"	Quite well, and in full work for nearly 1 year.

In 19 of the cases in this table a bacteriological examination of the sputum was made. The results were as follows :

	Cases.	Recovered.	Chronic.	Died.
No tubercle bacilli present -	8	8	—	—
Tubercle bacilli found in 10 :				
Small or moderate number	6	4	2	—
Many - - - - -	4	3	—	1
Totals - - - - -	18	15	2	1

In one case (after removal of tuberculous cervical glands) no tubercle bacilli were found in the sputum, but many streptococci. The rapid gain in weight shown in this table is worthy of notice. The gain in the first three weeks of treatment in 33 cases shows an average of 3.8 lb., the total gain in weight in 59 cases an average of 12.4 lb. In every one of the 70 cases both lungs were found to be affected ; but in almost all one lung was more affected than the other, though the difference was usually slight. In only 2 cases the right and left lungs were about equally affected. In 44 cases the right lung was more affected than the left ; in 24 cases the left lung was more affected than the right. Thus in this list of 70 cases the right lung was chiefly attacked nearly twice as often as the left.

Results obtained by Various Observers.

The idea of administering antiseptic drugs by the air-passages in cases of phthisis suggested itself to physicians thirty years ago. In 1877 the late Sir William Roberts claimed good results from the use of antiseptic inhalation by means of a "respirator-inhaler" which covered the mouth only, and which he directed to be "worn for fifteen, thirty, or sixty minutes several times a day." Dr. Coghill also employed a similar apparatus, and directed that the patient should inspire through the mouth and expire

through the nose, each such period of inhalation to last from 15 to 20 minutes. To Dr. Burney Yeo we are indebted for the invention, in 1882, of the simple inhaler of perforated zinc which has proved of such great value. It is still being made as Dr. Yeo recommended, but it has been found advisable (with Dr. Yeo's consent) to increase the size a little for patients with more prominent noses. This model is known as Yeo's inhaler (M), the original type being described as Yeo's inhaler (F); they are made by Squire and Son, 413 Oxford Street.

When Dr. Hassall, in 1885, doubted the value of drugs given by inhalation, Dr. Wilson Fox (*clarum et venerabile nomen*) replied: ¹ "The antiseptic effect has been doubted by Hassall, *but there can be no question* that inhalations practised in this manner, with creosote, thymol, eucalyptus, iodoform, iodine or terebene, tend to diminish cough and expectoration, and that in some cases marked improvement in the patient's state occurs during their use, even in very advanced stages." This statement by Dr. Wilson Fox may be commended to the careful consideration of physicians who are sceptical as to the value of such inhalations.

During the last thirty years the method of treatment thus initiated has been adopted with success by a few physicians, among whom special mention must be made of Dr. Beverley Robinson, of New York, who has followed the recommendations of Dr. Yeo, and made use of similar solutions for inhalation for many years. He has published numerous papers on the subject, in which he has given evidence of the value of this method of treatment in cases of phthisis, and especially in laryngeal tuberculosis.

For several years past Dr. Muthu, of the Mendip Hills Sanatorium, has made much use of antiseptic inhalation in the treatment of phthisis by means of solutions of menthol and formaldehyde employed for six or eight hours daily. He finds such inhalations very useful, and has published papers in support of this method of treatment. Dr. Garry

¹ *Diseases of the Lungs*, p. 884.

of Cairo has also published good results, and I am informed that as long as twelve years ago the late Dr. Huggard, of Davos, ordered antiseptic inhalation day and night continuously, with complete success, in a case known to my informant.¹

Method of Inhalation Treatment.

For the last seven years I have treated all my cases of pulmonary tuberculosis (except some seen in consultation at a very advanced stage) by the method of continuous antiseptic inhalation, by means of a Yeo's inhaler and the antiseptic solution of which the formula is stated above. In adopting this plan of treatment it seemed to me that certain conditions were necessary if the greatest possible amount of benefit was to be obtained.

1. The inhalation *must be continuous*, the inhaler being worn all day and all night, except at meal-times.

2. At the beginning of the treatment a *period of rest in bed is essential*. The importance of this in the treatment of tuberculosis is well understood in sanatoria. In addition, the compulsory rest directs the patient's attention to the necessity for careful and thorough use of the method.

3. Digestive disturbances, anorexia, and diarrhoea or constipation must be treated by appropriate drugs.

4. The patient must be supplied with a *sufficiency of easily digested food*. Malted milk dissolved in (scalded) milk given at the end of each of the four meals has proved invaluable for this purpose.

5. *Careful disinfection of the mouth* with equal parts of Sanitas fluid and water four times daily, after the milk, has

¹ In a letter to *The Lancet* (Nov. 23, 1912), Professor Ruata of Perugia states that he has made use of continuous inhalation of antiseptic substances by means of an oro-nasal inhaler since the year 1880. He adds: "This treatment of continuous inhalations is quite familiar here in Italy, and I think that at this moment while I am writing perhaps not less than 5,000 patients are using it. . . . I am quite confident in asserting, after an experience of thirty years, during which I have treated more than 2,000 consumptives, and seen treated many and many more, that when the tuberculosis is simply bacillary, the cure is certain."

been always ordered. As soon as the patient has begun to make definite progress carious teeth should be stopped or removed. Antiseptic sprays may be used for unhealthy conditions of the fauces, and a spray of cocain, eucalyptus and parolein to relieve any nasal obstruction.

6. *Smoking* must be absolutely forbidden.

These are the principles on which the 70 published cases were all treated.

I advise, therefore, that whenever a practitioner has reason to suspect that a patient is infected with incipient pulmonary tuberculosis, and has by careful percussion detected the presence of the six characteristic dull areas at the four apices, he should carefully note the size of these areas, the morbid sounds present, and the patient's weight ; and at once order a period of rest in bed for seven, ten or fourteen days according to the extent of the dull areas and the acuteness of the symptoms. Two Yeo's inhalers (each costing only 6d. or 1s.) should be procured, so that they may be used on alternate days and may be properly cleansed by immersion in boiling water and careful drying. These inhalers must not be covered with silk, for this hinders the access of air.

The solution of which the formula has been already mentioned should be supplied, and the patient instructed to pour six to eight drops on the felt of the inhaler *every hour* during the daytime, and once or twice during the night if he happens to wake. Nearly all patients soon become accustomed to wearing the inhaler at night. The object should be to keep the piece of felt constantly saturated with the solution, but so that none of it wets the framework of the inhaler itself. The base of the inhaler should be carefully wiped before it is applied, and a little vaseline or lanolin cold cream smeared over the nostrils and upper lip at first.

By simple precautions like these, with the use of an inhaler of proper size, any irritation of the skin of the nose or lips may be avoided. The possibility of such irritation is the only disadvantage of the method, and it may be

avoided if careful instructions are given at first. The inhaler must be worn persistently and removed only at meal-times. After the first day or two the patient, while in bed, may read, write, do hand-work, or play simple games. Dyspepsia and anorexia may be treated with sodium bicarbonate, nux vomica, and a vegetable bitter given a quarter of an hour before meals three times daily. The patient should be encouraged to eat freely of plain nutritious food, and at the end of each of his four meals he should drink slowly a half-pint of fresh milk which has been raised to the boiling-point and allowed to cool, and to which two teaspoonfuls (gradually increased to a table-spoonful) of malted milk has afterwards been added. The bedroom windows should, of course, be kept open, but the patient must be kept warm in bed and protected from draught. After his meals he should always rinse his mouth with equal parts of Sanitas fluid and water. Smoking must be absolutely forbidden. When the necessary period of rest in bed is at an end the patient may be allowed to sit up in his room, still wearing the inhaler persistently. Two or three days later he may be allowed to lay it aside for an hour in the morning and take a short walk out of doors. But when he returns he must at once replace his inhaler. At the end of three weeks the practitioner should again weigh his patient and again carefully record the size of the dull areas. Almost invariably a considerable gain in weight, often from 3 to 5 lb., will be discovered, and the size of the dull areas will be found to be definitely smaller. Cough will be much diminished—in many early cases it ceases altogether; sputum will be less and more easily expectorated; and the temperature chart will be more satisfactory. The patient generally feels so much better that he is quite willing to continue the treatment. He should now be instructed to practise simple breathing exercises three times daily in order to obtain a better expansion of the lungs. The inhalation treatment should be continued persistently (except for an hour in the morning) during the next four weeks, at the end of which

time the weight should again be taken, and the size of the dull areas carefully ascertained and recorded. If the progress of the case has been satisfactory during the first seven weeks it may now be possible to reduce slightly the number of hours of inhalation, but such reduction should be very gradual. The danger at this period is that the patient, feeling himself better, should grow careless. If he does, there is a considerable chance of a relapse, which will necessitate a return to bed for a fortnight with continuous inhalation. Experience shows that the patients who are most conscientious and persevering in carrying out the treatment improve most rapidly and are least liable to relapse. An early case may perhaps be able to return to ordinary life after three or four months of treatment, but one in which cavitation has occurred will need six months or longer. After apparent recovery the patient will do wisely to use his inhaler for one or two hours daily, and also at night, for a further period of six months. Whenever he is conscious of having "caught cold" he should remain in bed for a day or two days, and practise continuous inhalation all the time.

This treatment by antiseptic inhalation can be carried out in the patient's own home, if the hygienic and sanitary conditions are satisfactory. It is not usually necessary to send the patient to a sanatorium, so that there is a great saving in expense, and the practitioner does not lose charge of him. But where the home conditions are unsatisfactory it will be wise to send him to a sanatorium at which he will be permitted to carry out the treatment by inhalation. No idea of change of climate or foreign travel or sea voyage should be entertained until he has been through a course of inhalation treatment, and even then he must take his inhaler with him and use it freely.

I now venture to claim that my second question, as well as the first, may be answered in the affirmative. It is possible to provide the practitioner with a simple, inexpensive, and very effective form of treatment, which can be used in the patient's own home.

If every practitioner of medicine learned how to diagnose accurately at a very early stage the fact of incipient pulmonary tuberculosis, and treated it at once according to the method which I have described, it is quite certain that a very large diminution in the mortality from pulmonary tuberculosis could be effected within a very few years, and it would not be too much to hope that when the attention of the profession everywhere had been thoroughly aroused and the intelligent co-operation of all medical men completely secured, we might even see the dawn of a day when the disease formerly known as pulmonary phthisis had become a thing of the past. May that day come soon !

APPENDIX I.

THE PHYSICAL SIGNS OF INCIPIENT PULMONARY TUBERCULOSIS AND ITS TREATMENT BY CONTINUOUS ANTISEPTIC INHALATIONS.¹

THE object of this paper is to advocate an unusual method of treatment in the early, and especially in the earliest, stage of pulmonary tuberculosis. Incidentally it will be necessary to describe the earliest physical signs of a tuberculous infection of the lungs, which are inadequately and incorrectly described in the text-books.

The treatment most in favour at the present time for cases of pulmonary tuberculosis consists of absolute rest while pyrexia is present, abundance of fresh air, abundance of nutriment, and graduated exercise under medical supervision when pyrexia has ceased. It is certain that these measures have aided in the recovery of many. They place the patient under the most favourable circumstances for fighting his battle with the invading bacilli. But there is one obvious defect; they do not include any organised attack on the bacilli themselves. They place the patient under favourable circumstances, but they leave him to fight alone. Attempts have, indeed, been made to give actual assistance by the injection of tuberculin. But this treatment is by no means devoid of risk. If used at all, it can only be slowly, in carefully regulated minimal doses, and under constant observation of the opsonic index. It is very questionable whether such injections are ever justifiable in the early stage of pulmonary tuberculosis, for the opsonic index is then constantly varying in consequence of the autoinoculation produced by the local disease.

¹ Reprinted from the *British Medical Journal*, Dec. 11, 1909.

Attempts to combat the tuberculous infection by means of antiseptic substances, such as creosote or iodoform given by the mouth, have attained very little success, and these drugs may produce gastro-intestinal irritation. The idea of administering antiseptic drugs by the air-passages suggested itself to physicians thirty years ago. In 1877 Sir William Roberts claimed good results in phthisical cases from the use of antiseptic inhalation by means of a "respirator-inhaler," which covered the mouth only, and which he directed to be "worn for fifteen, thirty, or sixty minutes several times a day." Dr. Coghill also employed a similar apparatus, and laid stress on the necessity that the patient should practise inspiration by the mouth and expiration by the nose. "Each inhalation should last from fifteen to twenty minutes, and may be with advantage frequently repeated." The formula which he recommended in 1881 was: \mathcal{R} Tinct. iodi aetherealis \bar{z} ij, acidi carbolicum \bar{z} ij, creosoti vel thymoli \bar{z} j, sp. vini rect. ad $\bar{5}$ j; and he also said that "where cough is urgent, or breathing embarrassed, chloroform or sulphuric ether may be added at discretion." The quantity of the solution to be used, was "10 to 20 drops twice a day at least," and he left the frequency of use largely to the decision of the patient himself. He adds: "A great many of my patients have of their own accord come to use the respirator almost continuously day and night, from their experience of its good effects."

Dr. Burney Yeo, in a lecture delivered in King's College Hospital in 1882, advocated a new and simple oro-nasal inhaler constructed of perforated zinc, and for use therewith he advised a mixture of "creosote, carbolic acid, eucalyptol, or turpentine, with equal parts of spirits of chloroform." He pointed out that such an inhaler is extremely cheap, that it is light and comfortable to wear, that patients find no difficulty in sleeping with it on, and that cough is rapidly relieved. He preferred a mixture of equal parts of creosote and spirits of chloroform, though he sometimes employed carbolic acid or eucalyptol, and occasionally iodine. He found turpentine useful in cases of hæmorrhage. He advocated "continuous or almost continuous inhalation." He stated that many cases under his care had improved remarkably by using this inhaler, and he gave the particulars of one very striking case. But he does not claim that by the use of this method it is possible definitely to arrest the disease in its early stage.

Dr. Hassall, in his treatise on *The Inhalation Treatment of Diseases of the Organs of Respiration, including Consumption,*

published in 1885, endeavoured to prove that oro-nasal inhalers, and especially Dr. Yeo's, were practically useless ; that a very small amount of the carbolic acid or other antiseptic used really found its way into the lungs ; and that the only effective method was to place the patient in a chamber filled with antiseptic vapour. His objections, however, were founded on theory and on calculation, not on observation of clinical results. His inhalation chamber is practically impossible in most instances, but his criticism seems to have been accepted by the profession, and to have produced a scepticism which resulted in an almost complete disuse of the method. Yet that excellent clinical observer, Dr. Wilson Fox, wrote : " The antiseptic effect has been doubted by Hassall, but there can be no question that inhalations practised in this manner, with creosote, thymol, eucalyptus, iodoform, iodine, or terebene, tend to diminish cough and expectoration, and that in some cases marked improvement in the patient's state occurs during their use, even in very advanced stages."

If a treatment by inhalation of antiseptics is to be really effective, three conditions are essential :

(1) It must be continuous and constantly in operation during the whole of the twenty-four hours, except at meal times.

(2) The inhaler employed must be light and capable of being worn both in the daytime and during sleep ; it must not hinder respiration, and it should be cheap.

(3) The solution employed should be as strong as possible, and it may with advantage be composed of a combination of several volatile antiseptic substances.

During the last four years I have treated all my cases of early pulmonary tuberculosis by this method, and the results have been so remarkable that I desire to bring them before the profession, in the hope that the method may be generally used. The inhaler employed has been the simple oro-nasal cage of perforated zinc advocated by Dr. Burney Yeo. It is worn over the nose and mouth, and is kept in place by elastic bands behind the ears ; it contains a piece of sponge or felt on which the solution is dropped. The only precaution necessary is to take care that the edges of the inhaler, which rest on the skin, are not wetted, lest the skin should be stained or made sore. The antiseptic solution which I have employed has been : \mathcal{R} acidi carbolicum \mathfrak{z} ij, creosoti \mathfrak{z} ij, tinct. iodi \mathfrak{z} j, spir. aetheris \mathfrak{z} j, spir. chloroformi \mathfrak{z} ij. Of this solution, 6 to 8 drops are poured on the felt of the inhaler every hour during the daytime, and two or three times during the night if the patient is awake.

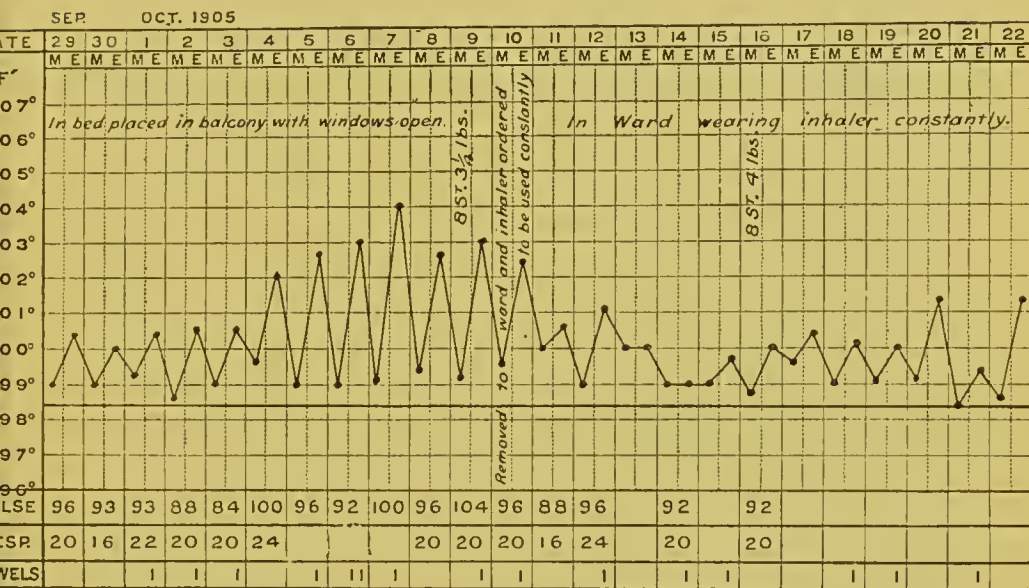
The odour of the solution is not unpleasant, and patients appear to derive great benefit from its use. Cough is rapidly relieved without any sedative or expectorant medicines, and sputum, if any, is more easily expectorated and is lessened in quantity. The use of this solution has no irritating tendency, nor does it cause hæmoptysis. If hæmorrhage should occur, it might be well to remember Dr. Yeo's suggestion and to add turpentine to the solution. The absolutely continuous use of the inhaler (except at meal-times) must be rigidly required, and it is very desirable to keep the patient at rest in bed for a week at least, the windows of his bedroom being widely open. During the second week he may be allowed to rise for an hour or two daily, but the continuous use of the inhaler is essential. When the temperature is normal, after the first ten days or so, he may be allowed to omit the inhaler for an hour every morning and to take a walk in the open air. Gradually the periods of exercise may be increased and the number of hours during which the inhaler is used may be very gradually diminished.

Two other points claim attention from the outset. The first is the condition of the teeth, gums and throat. After every meal the mouth should be rinsed with Sanitas fluid and water in equal parts. As soon as possible decayed stumps of teeth should be extracted and carious teeth filled or removed. If the tonsils or fauces are unhealthy, they may be sprayed with a solution of perchloride of mercury of the strength of 1 in 2,000. If there is any nasal obstruction it is advisable to spray the nostrils thoroughly two or three times daily with R cocain gr. iv., ol. eucalypti ʒss, parolein ʒj, by means of a parolein-spray apparatus. If the patient is a smoker, it is necessary that he should give up the use of tobacco at once and permanently.

The second point which claims attention is the question of nutriment. It is essential to administer a sufficiency of easily digested and nutritious food. I insist on every patient taking four times daily, in addition to his ordinary meals, a half-pint of (scalded) milk to which from a dessertspoonful to a table-spoonful of "malted milk" has been added.

Before relating the thirty cases of incipient or early pulmonary tuberculosis which I have treated by continuous anti-septic inhalation I insert a temperature-chart taken from a case of advanced phthisis in which the employment of this method caused an immediate reduction of the hectic temperature, with arrest of sweating and slight gain in weight.

W. C., aged 32, was admitted into St. Mary's Hospital during my autumn holiday in 1905. When I resumed charge of the wards in October I found his bed placed on a sheltered balcony, with open windows to allow continuous fresh air as fully as possible. Removal from this to a hospital ward, with the use of continuous antiseptic inhalation, produced the striking effect shown by the chart. The course of the disease became much less acute, and finally so chronic that it was necessary to transfer him to an infirmary.



The following cases have been treated by this method :

CASE I.—I. B., aged 19, was admitted into St. Mary's Hospital under my care on March 8th, 1907, with signs of early tuberculous affection of both upper and lower apices of both lungs and evidence of fluid effusion into the left pleura. There was persistent pyrexia, the temperature being between 101° F. and 102° F.; twice in the first week it fell to 99° F., and once rose to 103° F. The antiseptic measures I have mentioned were begun at once, and she wore the inhaler day and night. There was no sputum. The pulse-rate varied from 84 to 100, the respiration-rate from 28 to 36. On March 17th, 33 oz. of clear fluid were aspirated from the left pleural cavity; this fluid was found to be sterile. On March 18th her weight was found to be 8 st. 10½ lb. The antiseptic measures were continued. During the second week her temperature varied from 99° F. to 101° F.; it first fell to normal on March 23rd. It was a little irregular from March 25th to March 27th, and again from April 2nd to April 7th, but after this it remained persistently normal. On March 27th her weight was only 8 st. 5½ lb., showing a loss of 5 lb. in nine days. From March 27th to April 6th

she had diarrhoea, so that I feared she might have tuberculosis of the intestine, and her weight fell to 7 st. 13 lb.—a total loss of 11½ lb. But the inhaler had been worn persistently day and night from the first, and now came the turn of the tide. After April 7th, the temperature remained normal, and she began to improve rapidly. On April 10th her weight was 7 st. 13½ lb.; on April 18th, 8 st. 6½ lb.; on April 25th, 8 st. 11½ lb.; on May 1st, 9 st. 2½ lb.; on May 6th, when she was discharged, 9 st. 5½ lb.—a gain of 20 lb. in twenty-six days. The difference in her appearance was extraordinary. One would hardly have known her to be the same patient.

CASE 2.—Mr. S., a medical student, was under my care in St. Mary's Hospital for several weeks in the summer of 1906. He had pyrexia, cough, and marked signs (with crepitant sounds) at all four apices. On two separate occasions the sputum was found to contain large numbers of tubercle bacilli. His opsonic index was found to vary from 0.9 to 1.2. He was kept at rest in bed, an icebag was applied over the affected areas of lung, and the antiseptic measures described above were employed at once, the inhaler being worn night and day from the first. His temperature soon fell to normal, his physical signs improved, and before he left the hospital he had gained 2 lb. in weight. Though the first and second examinations of his sputum showed large numbers of bacilli, on the third examination they were rather difficult to find. He now spent several weeks at Llandrindod Wells, wearing his inhaler most conscientiously, living as far as possible in the open air, and taking plenty of milk. When he returned to London in October he had gained 20 lb. in weight. His sputum was very scanty, but it still contained a very small number of bacilli. His improvement was so marked that I decided that it was unnecessary for him to go to Davos for the winter, as he was willing to do, and that he might gradually resume work. This he did cautiously, and with excellent success. His weight continued to increase, and on March 16th, 1907, it was 11 st. 1½ lb.—a total gain since his illness of 30 lb. At this date he was still using the inhaler about an hour daily; he had recently passed safely through an attack of influenza. This gentleman still continues in excellent health, looks extremely well, and has done hard work and gained distinction in his hospital classes.

CASE 3.—Mr. E., aged 34, was seen by me in consultation with Mr. Jessett, F.R.C.S., and Dr. English, on June 17th, 1907. Five weeks previously Mr. Jessett had removed a chain of caseous tuberculous glands from the right cervical region. The wound healed well, but two days after the operation the temperature rose gradually and became of hectic type. The pyrexial period lasted seventeen days. For six days the temperature was nearly normal. This was followed by another pyrexial period of ten days; it was now again normal. The pyrexia was accompanied by increasing dyspnoea, he was expectorating thick mucoid sputum, and some night sweats were present. No tubercle bacilli could be found in the sputum, but the physical signs were quite typical of a tuberculous infection of both lungs. The patient was at this time in a nursing home in South London, but he determined to go back to his lodgings near Westbourne Park Station. I saw him again, in consultation with Dr. Thoresby Jones, on June 29th. He occupied two rooms on the first floor in a rather narrow street on a

motor omnibus route—by no means an ideal place for the treatment of such a case. His bed was in the back room ; the folding doors were thrown back, and both windows of the front room were constantly widely opened. He was fortunate in obtaining the help of a most excellent nurse. It was found that the physical signs had considerably increased during the twelve days, and there was now a pleural effusion on the right side. This fluid was drawn off and proved to be sterile. After the aspiration the side was strapped and an icebag applied. A Yeo's inhaler was worn constantly day and night, in accordance with the method already described, and he was fed almost exclusively on milk and malted milk. The sputum increased rapidly in amount, and became muco-purulent, the temperature continued at 102° F., and there was discomfort about the larynx. An icebag was applied over this region, and two others over the lung. The very copious and purulent sputum was examined bacteriologically, and was found to be full of streptococci. This fact, indicating a streptococcal infection of a tuberculous lung, seemed to me to render the prognosis almost hopeless. On July 11th a very violent paroxysm of coughing occurred, lasting five or six hours, when he brought up much purulent material and some blood. The temperature rose to 103° F., and the pulse to 130 for a short time, but this soon subsided, and he seemed better. He was assiduously nursed and carefully fed, and his appetite began to improve. The inhaler was worn persistently. From June 26th to July 4th the temperature was from 100° F. to 102.3° F. ; from July 4th to July 10th, 99.5° F. to 101° F. ; from July 10th to July 14th, 99° F. to 100° F. ; and on July 14th it became normal permanently. On July 23rd he was still improving, and was obviously gaining flesh ; sputum much less, but still copious and muco-purulent ; one or two slighter paroxysms of coughing. There was now resonance in the right axilla (where the fluid had been), but an area of dullness existed at the right anterior base and the right posterior base, with some bronchial breathing and moist sounds—clearly a basic cavity. On August 16th he had sufficiently recovered to come to my house, and I found that there were still signs, though less marked, of a cavity at the right base. He looked decidedly stouter. His weight was found to be 11 st. 10½ lb., his weight in health having been 12 st. 6 lb. He was sent into the country, and persisted in the use of his inhaler. After this his recovery was uninterrupted, and he resumed his work. I examined him again on April 28th, 1909, after an interval of a year and eight months. All the old dull areas could be detected, but there was no bronchial breathing, no prolonged expiration, and no crepitant sound—in short, no sign of activity. His weight had increased to 15 st. 6 lb.—an increase of no less than 52 lb. He looked so well that I hardly recognised him at first sight. He had done full work for more than eighteen months, from 9 a.m. to 7 p.m. each day, in an ill-ventilated shop, and had enjoyed a summer holiday in France.

These three cases give sufficient proof of the curative influence of continuous antiseptic inhalation in a tuberculous, and even in a streptococcal, invasion of the lungs. They justify the hope that if this treatment can be adopted in the earliest stage of a pulmonary tuberculosis, we may be able definitely and completely to arrest the disease. If we are to have any

prospect of abolishing pulmonary phthisis—one of the greatest scourges of the human race—we must attack it long before any bacilli can be found in the expectoration. In the great majority of cases of pulmonary tuberculosis, definite and characteristic physical signs are present for weeks or months before the patient begins to expectorate. To wait for tubercle bacilli in the sputum before diagnosing pulmonary tuberculosis is like delaying the diagnosis of cancer until the glands are involved. It is therefore essential to acquire accurate ideas as to the exact localisation in the lung of an incipient pulmonary tuberculosis, and as to the physical signs which are caused by it. For a statement of the current teaching on this subject I turn to the latest authoritative monograph, the article on “Tuberculosis of the Lung” in *Green’s Encyclopædia and Dictionary of Medicine and Surgery*, vol. vi., published two years ago. In this article, written by a physician of wide experience, there is a section on p. 35, under the title “Physical Signs of Incipient Tuberculosis,” which states that “The early determination of pulmonary tuberculosis by physical signs affords scope for great refinement of methods. In proportion to the earliness of the process the physical signs are slighter; they are, consequently, apt to be missed. Reliable skill can only be obtained after prolonged and careful practice. *Auscultation* affords the more delicate tests. The auscultatory phenomena include slight modifications of the normal respiratory murmur—for example, enfeeblement, harshness, interrupted or cogwheel or jerky respiration, prolonged expiration, blowing expiration (broncho-vesicular). When the respiration is actually bronchial, the process is something more than incipient merely. . . . *Percussion* yields results of importance even at early stages. All portions of the lung must be examined. Corresponding portions must be compared with care; more especially, the two apices must be tested comparatively in respect of percussion sound and extent of resonant area.”

This statement as to the earliest physical signs in an incipient pulmonary tuberculosis, and similar statements in the text-books, seem to me both erroneous and very inadequate—erroneous in assigning greater importance to auscultation than to percussion, and quite inadequate in the information given as to the regions of the thoracic wall where we may expect to find the earliest changes. Yet it is now nearly twenty years since Dr. Kingston Fowler pointed out that tuberculosis of the lungs begins, in an overwhelming majority of cases, at

certain definite localities in the lung, and that the disease progresses by well-defined routes. This statement was founded on Dr. Fowler's experiences of autopsies at the Brompton Hospital. It has found its way into some of the text-books, and is recognised as conveying true information of pathological fact; but it has produced little or no modification of the descriptions of the clinical picture of the disease. Dr. Fowler showed that the earliest lesion occurs not at the very summit of the lung, but at a spot about 1 in. to $1\frac{1}{2}$ in. below the summit, in the lung as seen in the *post-mortem* room. This will correspond to a greater distance, probably quite 2 in., in the expanded air-containing lung. From this site the process may extend either backwards towards the suprascapular fossa, or downwards and outwards into the second intercostal space. Clinically this can quite easily be recognised by careful percussion. The earliest physical signs (dullness and lessened air-entry) may usually be first detected in the innermost part of the first intercostal space on one or both sides, extending from one to three fingerbreadths from the sternum, and possibly also in the second space at about one fingerbreadth from the sternum. Posteriorly they may be detected quite close to the uppermost dorsal vertebræ on either side, a region which normally is quite resonant. Dr. Fowler also pointed out that less commonly the site of the earliest lesion was situated more externally, and this also is recognised clinically by dullness in the outermost part of the first, and sometimes of the second, intercostal spaces; posteriorly it can be detected in the outer part of the suprascapular fossa, occasionally also in the upper axilla. This area of dullness often exists along with that first described, while the mid-clavicular region remains much more resonant.

In the lower lobe also a similar tuberculous focus is apt to be developed at a very early stage, with, or very soon after, the focus in the upper lobe. Dr. Fowler stated that in the lower lobe also the situation of this early lesion is about 1 in. to $1\frac{1}{2}$ in. below the summit of the lower lobe, and that it is apt to spread downwards and outwards along the lower edge of the interlobar fissure. He described the position at the back of the chest where this lesion was to be looked for. Clinically it is quite easy to verify these facts if careful percussion is practised over the inner extremity of the spine of the scapula and the adjoining region.

These areas at the four apices are the most frequent and characteristic, but occasionally small areas of dullness may be

found in front in the right middle lobe, and in the antero-lateral region of the anterior base of the left lung ; posteriorly, at the posterior scapular edge, at the scapular angle, or near the posterior base of the lung. The existence of dullness and lessened air-entry at these various localities is quite easy to detect. All that is required for their discovery is care, patience, a correct method of percussion, and a little practice. Anyone who is willing to take a little trouble can satisfy himself of the accuracy of what I have stated. Over these dull areas auscultation often reveals nothing but a defective air-entry, though very slight crepitant sounds may be present ; such sounds may or may not be removed by a cough. At a slightly later stage the inspiration may be a little harsh or interrupted ; the expiration slightly prolonged. When bronchial breathing, bronchophony, and distinctly audible whisper are present, there is either consolidation around a bronchial tube or a definite cavity.

I may point out the similarity of the earliest physical signs in pulmonary tuberculosis to the earliest physical signs in pneumonia. On the first day of a pneumonia, before any sharp crepitation or any bronchial breathing is developed, it is often possible to detect by careful percussion a small area of diminished resonance or actual dullness, over which the only auscultatory sign is deficiency of air-entry. In both tuberculosis and pneumonia the similar phenomena are due to a similar cause, a local microbic invasion and a local arrest of pulmonary function.

The typical localisation of these areas of dullness and lessened air-entry at the four apices is, in itself, almost proof of a tuberculous infection of the lung, but in young subjects they may be simulated (though not often exactly) by simple collapse, and occasionally by broncho-pneumonia, or by enlarged bronchial glands. They are not necessarily proof of an *active* tuberculous lesion ; they may be the abiding result of a former lesion which has recovered or become quiescent. Local crepitant sounds over these dull areas, pyrexia, hacking cough, hæmoptysis, or local tenderness, would indicate an active lesion. These physical signs are the earliest obtainable evidence of the existence of pulmonary tuberculosis. They are long antecedent to the appearance of any sputum, and therefore to any possibility of microscopical examination. They are also quite distinct long before any evidence can be obtained by the use of Roentgen rays ; the statements which have been made to the contrary are founded on inaccurate

percussion. But a variability of the opsonic index may exist along with the earliest pulmonary signs ; of this I have twice had proof. A worker in the bacteriological laboratory was found to have a varying opsonic index to tubercle, though he felt quite well. He came to me and requested me to examine his lungs. I found minimal areas in the characteristic positions, measuring from a half to one fingerbreadth—that is, 1 to 2 cm. He did not practise inhalations, but went to a sanatorium, where two months later he had a pyrexial attack lasting a week, and a few tubercle bacilli were found in his (very scanty) sputum. He remained in the sanatorium four months, and gained 8 lb. in weight. I examined him again on his return, and found all the dull areas distinctly larger, but quiescent, and he seemed to be in good health. The second case is the converse of the first. A patient who had had a brief attack of pleurisy on the left side, and who quickly recovered, was found to have minimal characteristic areas in the left lung only. There was also slight enlargement of cervical glands. An investigation of the opsonic index to tubercle was suggested and carried out ; it was found to be varying. The variability fortunately lasted only a few days.

The dull areas of pulmonary tuberculosis differ much in size. They may be detected when they measure only half a fingerbreadth, or 1 cm., but they often measure about two fingerbreadths. In a severe case they may reach three fingerbreadths, and as much as four in the latest stages of the illness. The auscultatory signs will be determined by the amount of implication and destruction of the pulmonary structure. The possibility of accurate measurement by percussion makes it easy to construct a rough diagram showing the localisation of these areas, and the number of fingerbreadths in each can be recorded by figures. Thus, the condition at one visit can be compared with that found at a subsequent visit. The areas may be found to be smaller when the case is improving, and larger if the disease has progressed. I find these records quite trustworthy, and of the greatest assistance in helping to determine whether improvement or deterioration has occurred.

I now add a brief description of twenty-seven other cases of incipient or early pulmonary tuberculosis treated by the method of continuous antiseptic inhalation :

CASE 4.—Mr. M., aged 33, seen with Dr. Mowll, of Surbiton, July 3rd, 1905. After a sharp attack of influenza he was found to have signs of tubercle at all four apices. Loss of weight, 7 lb. Recovered under constant use of inhaler, and gained weight, 14 lb. Went back to work,

and in December, 1906, was examined for life insurance and accepted as a "first-class life." But in January, 1907, he had a fresh attack, chiefly in the left lung. He was again kept at home for a fortnight, and used his inhaler persistently; again regained the weight lost, and resumed his occupation, which involves both mental and physical strain. He has remained quite well, and is fully equal to his duties.

CASE 5.—D. B., aged nearly 13, the son of a medical man, had been sent home from boarding-school because ill. Tall, but $2\frac{1}{2}$ lb. under average weight for age. Short cough. Signs (November, 1906) at all four apices. Under continuous antiseptic inhalation his cough vanished in a few days; he gained 6 lb. in weight in five weeks, and looked better than for two years. Advised still to use the inhaler three hours daily. He continued to improve; a year later he had gained 14 lb. more, and a year later still an additional 9 lb. In November, 1909, Dr. B. writes: "My son Douglas keeps well, loses no time at school, enjoys the games, and writes home for large cakes to be sent."

CASE 6.—A hospital sister. Signs in left lung only at first, later at all four apices and one lower area. Loss of weight, 7 lb. No sputum. Weight gained in first three weeks of treatment, $3\frac{1}{2}$ lb.; in the next month, 5 lb.; total gain, $8\frac{1}{2}$ lb. Recovered completely, and for eight-months has fulfilled her arduous duties with conspicuous ability and success.

CASE 7.—Miss M., M.B.Lond. Signs at all four apices. Weight lost, $4\frac{3}{4}$ lb. No sputum. Weight gained in first three weeks of treatment, $2\frac{3}{4}$ lb.; during the next month, $12\frac{1}{2}$ lb.; subsequent gain, 15 lb.; total gain, 30 lb. (Her weight rose from 114 lb. to 144 lb.) She has been quite well for two years, and is now doing school inspection work six hours daily for five days a week; is giving ambulance lectures, and has private practice.

CASE 8.—Miss M., aged 28. Signs in left lung only at first, afterwards at all four apices and four lower areas. No sputum. Had lost weight. During first three weeks of treatment lost $\frac{3}{4}$ lb., and afterwards regained it; during the next month gained another pound. She then felt much better and her cough had disappeared. I have heard from her recently that she is still well.

CASE 9.—Admiral X., aged 50, seen in consultation with Dr. G. A. Simmons, of Westminster, April 11, 1907. Eight months previously a little pleurisy on left side; four months ago another attack on right side, with a little hæmoptysis. Yesterday again pain in side and slight hæmoptysis. Signs of tubercle in right lung only. Under continuous antiseptic inhalation he rapidly recovered, and in June, 1908, was "in excellent health," and doing important public work.

CASE 10.—Mrs. R., aged 38. Signs at all four apices, and a small cavity at left lower apex; sputum mucoid, no tubercle bacilli found. Weight gained in first three weeks of treatment, 4 lb., and during the next month, 8 lb.; total weight gained, 12 lb. Cough and sputum much less; looks much better. I have not heard from her during the last two years.

CASE 11.—K. S., aged 17, housemaid. Signs at all four apices; subsequently developed a small cavity at right apex; no sputum. Her weight was not taken until after six weeks' treatment; it was then 97 lb.; she gained 6 lb. Recovered and remained well for six months, then caught fresh cold from a wetting, and developed a few fresh signs, but two months later she was "much better."

CASE 12.—Mr. C., aged 25, brought by Dr. G. A. Simmons, of Westminster. Four years previously, after an attack of influenza, was ill for three weeks with pyrexia of hectic type. Recovered slowly, and after this had cough each winter, and some sputum with occasional streaks of blood. Loss of weight, 7 lb. Frequent short cough. Tubercle bacilli not found in sputum. Signs at all four apices and two lower areas. Under continuous antiseptic inhalation his cough ceased in a week, and his first remark on his second visit was "I can't think where my cough has gone to!" Gain of weight in first three weeks of treatment, $2\frac{1}{2}$ lb.; during the next month, $4\frac{1}{2}$ lb.; subsequent gain, $2\frac{1}{2}$ lb.; total, $9\frac{1}{2}$ lb. He spent some months of the winter of 1907-8 at a high altitude station in the Rhone Valley, under the observation of Dr. Tidey, of Montreux, using his inhaler six hours daily and at night, and returned to England in excellent health. I have recently heard from him that he has gained 7 lb. in weight since I last saw him.

CASE 13.—Mr. P., aged 36, sent by Dr. Wilson, of Boston. Signs at all four apices and four lower areas. Sputum scanty. Tubercle bacilli not found. Has lost 2 lb. in weight during the last three weeks. Under inhalation treatment he gained 5 lb. in four weeks. He continued to improve, and six months later was quite well, except for some chronic nasal obstruction. He has remained well.

CASE 14.—H. C., aged 19, brought by Dr. Hickley, of South Lambeth Road. Slight hæmoptysis two years ago, with signs at right apex. Two more attacks of slight hæmoptysis recently. Signs at all four apices and five lower areas. Under inhalation treatment he gained 1 lb. in the first three weeks. He used his inhaler for some months, and a year after his first visit to me, Dr. Hickley reported that he had been "quite well for some time." I have recently heard that he continues well.

CASE 15.—K. P., aged 15, sent by Dr. Brooks, of Felixstowe, under whose care he had been for a month on account of pleurisy at the right base. His illness began two months ago. He had improved in general condition, having gained 7 lb., but the physical signs were stationary. A sister of his father's had died of phthisis after an illness of only ten weeks. His weight when he came to me on September 18th, 1908, was 9 st. 7 lb.; he showed signs of tubercle at all four apices and five lower areas, including two large ones at the right base, but apparently no pleural effusion. The treatment by continuous antiseptic inhalations was adopted at once, under the supervision of Dr. Balgarnie and Dr. Adams, of Hartley Wintney, Winchfield, Hampshire, and a very thorough open-air treatment was at the same time carried out by them, the boy living in an open shelter in his father's garden. Sputum very scanty. Twelve days later Dr. Balgarnie wrote that the cough was almost gone, and that he had gained 7 lb. in weight. In another month he gained 10 lb. more, and subsequently 3 lb.: total gain, 20 lb.

In December, 1908, he looked fat and well, and had not coughed for a long time. His weight was then 10 st. 13 lb. In November, 1909, Dr. Balgarnie writes that he had recently examined the boy's chest very carefully, and could find no evidence of any disease of the lungs; he considered him cured.

CASE 16.—Mr. H., aged 20, a patient of Dr. Nettell, of Shirebrook, Mansfield. He had no cough, but had suffered from repeated attacks of tonsillitis. Four years previously he had suffered from pleurisy; he had lost 3 lb. in weight; he had signs at all four apices and four lower areas, the largest being at the right lateral base—doubtless the remains of the former pleurisy. No sputum. Under the antiseptic treatment by inhalation and sprays to throat and nose he rapidly improved, gaining $3\frac{3}{4}$ lb. in weight. He returned to his work as a mining engineer, and he continued well. It is doubtful whether some of his dull areas were not of old standing, the legacy of his attack four years previously, but they appeared to diminish slightly while he was under treatment.

CASE 17.—A. W., aged 26, marine engineer; sent by Dr. Beaumont, of East Ham. He had had cough for four months, and had been taken ill on shipboard. He was admitted into hospital at Sydney, Australia, and remained there ten weeks. He had been back in England for one week. He showed signs at all four apices and five lower areas, with a cavity at the right apex; he looked very ill, and had lost more than 3 lb. in weight. Under treatment by antiseptic inhalation he rapidly improved, and when I next saw him, four months later, he had gained $15\frac{1}{2}$ lb. in weight. Three months later still there had been a further gain of 3 lb.; total gain, $18\frac{1}{2}$ lb. He looked quite a different man, and had very slight cough, in the morning only. There were still signs of a cavity at the right apex. I have heard no more of him.

CASE 18.—C. G., aged 40. Had suffered from occasional slight attacks of hæmoptysis since 28 years of age, with slight cough. When he came to me on February 14th, 1909, he had had a "cold" for five weeks, followed by an attack of hæmoptysis more severe than ever before. He showed signs at all four apices and two lower areas, with possibly a small cavity at his right apex. After a week in bed, with continuous antiseptic inhalation, he returned to his work. He was able to wear the inhaler in his office for seven hours daily, also at night. During the first three weeks of treatment he gained $3\frac{1}{2}$ lb.; during the next month, 3 lb., and subsequently 2 lb.: total gain, $8\frac{1}{2}$ lb. His friends, he stated, "never saw him look so well." After giving up the inhalations he had a small extension of physical signs in the right second space, and lost $1\frac{1}{2}$ lb., but a return to the treatment soon arrested this. He is now in excellent health and doing full work.

CASE 19.—Miss T., aged 18, sent by Dr. Wilson, of Boston. Cough for three months, but no sputum. Signs at all four apices and two lower areas. Under treatment by continuous antiseptic inhalation the cough soon disappeared, and she gained $2\frac{1}{2}$ lb. in weight. I heard last month that she was very well "and growing quite fat."

CASE 20.—Miss H., aged 22, sent by Dr. Leeson, of Twickenham. Signs at first only in left lung posteriorly, but afterwards at all four

apices and two lower areas. She had lost $2\frac{1}{2}$ lb. in the last three weeks. Under treatment by continuous antiseptic inhalation there was steady improvement; the cough rapidly diminished, and she told me that "life was now worth living." She gained 2 lb. in the first three weeks; $1\frac{1}{2}$ lb. during the next month, $2\frac{1}{2}$ lb. subsequently: total gain, 6 lb. Is still using the inhaler, and is "wonderfully better" and very active.

CASE 21.—Mr. B., aged 36, sent by Dr. Grove, of St. Ives, Hunts. His illness began eight months previously, with catarrh and hæmoptysis. Dr. Grove found signs of tubercle at the right apex, but no bacilli in the sputum. Cough worse for four months. Had lost 4 lb. Dr. Grove found tubercle bacilli for the first time the day before the patient came to me. There had been phthisis in his mother's family, and his father died of rheumatic fever. The patient had had pains in his knees, and was found to have a moderately dilated heart, a systolic apex murmur, and a short presystolic. He had signs of tubercle in his lungs at all four apices and two lower areas. After two weeks' rest in bed and continuous use of the inhaler he was able to return to his office, wearing the inhaler while at his work, and altogether about twenty hours out of the twenty-four. During the first three weeks he lost $\frac{1}{2}$ lb.; but in the next month gained $4\frac{1}{2}$ lb., and subsequently $14\frac{1}{2}$ lb., a total gain of $18\frac{1}{2}$ lb. He is now doing full work without fatigue, and gradually lessening his use of the inhaler. He feels very well.

CASE 22.—Mr. P., aged 38, sent to me by Case 3. Cough for four months. Felt ill and unequal to his work for one month. Signs at all four apices and four lower areas; no sputum. After a week's rest in bed with continuous antiseptic inhalation he returned to his work, and was able to wear his inhaler for several hours daily, and at night. The cough disappeared within a week. Gain of weight in first three weeks, 4 lb.; during the next month, 5 lb.; total gain, 9 lb. During July he had to work twelve hours a day, and he lost ground a little; but he persevered with the inhalations, and by September had quite recovered. He was doing his full work without fatigue, and had had no cough for three months.

CASE 23.—Mr. H., aged 32, also sent by Case 3. Illness began four months previously, and he lost weight rapidly. He also suffered from hydrocele, which was tapped several times. Temporary improvement occurred, but a fortnight ago he went to Germany for a week and experienced "shocking weather." Came back feeling ill. Showed signs at all four apices and two lower areas, with a cavity at his right apex. Evening temperature, 99.8° F.; sputum scanty, but containing numerous tubercle bacilli. A week after his first visit to me he had hæmoptysis twice, and his temperature rose to 103° F. I saw him again six days later at his own home, in consultation with Dr. Rudd of Acton. The temperature had fallen to 101° F. I found a quite new dull area above the left nipple, with sharp crepitant sounds, and the former physical signs were more marked. Evidently the disease was progressing rapidly; but under persistent antiseptic inhalation he improved more than we had dared to hope, the temperature fell to normal, and remained normal. He kept his bed for five weeks. There was no more hæmoptysis, and the cough became much less. He gradually increased in weight, and had gained 5 lb. in the eight weeks in spite of his severe attack. The physical signs were more advanced,

and in addition to the cavity at his right apex there were signs of cavitation in three other situations. He was gaining strength, and was walking about two miles daily; cough not troublesome, still some sputum. He was advised to go to Bournemouth, and to wear his inhaler six hours daily and at night. I have not heard from him again, but I have heard indirectly that he is purposing to emigrate to South Africa, and that he has grown so much stouter that he has been compelled to have his clothes enlarged.

CASE 24.—Miss M. R., aged 13, the daughter of a medical man (deceased), had suffered from a "tuberculous finger" at 6 months of age; it was opened surgically, and healed slowly. For about a year she had had cough and some pain in her side. Sputum scanty, and did not contain bacilli. Signs at all four apices and four lower areas. Under the use of continuous antiseptic inhalation her cough ceased in a week, and in six weeks she gained 14 lb. in weight. I saw her again five months later, and found a further increase of 11 lb.: total gain, 25 lb. She looked and felt extremely well.

CASE 25.—Mr. A., aged 37, brought by Dr. Higgins, of Hornsey Road. Cough five weeks; loss of weight, 7 lb. Signs at all four apices and four lower areas, with a cavity at the right apex. No sputum. Under treatment by continuous antiseptic inhalation he improved steadily. Gain of weight in the first three weeks, 5½ lb.; during the next month, 5 lb.; subsequently, 7 lb.; total 17½ lb. His employers having generously allowed him a complete holiday, he was able to use the inhaler during nearly the whole of the twenty-four hours for the period of five months. When last examined, on August 4th, he was perfectly well, the cavity having become obliterated. Since then he has gained 2¾ lb., and for three months has done his full work without fatigue.

CASE 26.—Rev. W. W., aged 42, a patient of Dr. Wilkin, of Newmarket. Ill eight weeks; loss of weight, 4 lb. Hæmoptysis ten days ago. Two brothers had died from phthisis, aged 38 and 48. Signs at all four apices and three lower areas. Under treatment by continuous antiseptic inhalation he gained 9 lb. in the first three weeks, and 11 lb. during the following month. He improved rapidly, and when examined on October 13th there were no active signs in his lungs, and he had gained 6 lb. more: total gain, 26 lb. Was doing full clerical duty without fatigue.

CASE 27.—Miss S., aged 34, sent by Dr. Havell, of Felixstowe. Aching pain in her right chest, with sense of constriction and some dyspnœa for nine months previously; worse during the last six weeks. Very slight hæmoptysis. Signs at all four apices and two lower areas, with a cavity at the right apex. No sputum. Under antiseptic inhalation, continuous so far as her duties would allow, she has slowly and steadily improved. She has gained 3½ lb. in weight, her cavity has slowly decreased, there has been no cough for some time, and only occasionally any pain. She is doing her full share of work without fatigue.

CASE 28.—C. H., aged 9, the ill-developed and half-starved child of very poor parents, living over a stable, was found on April 30th, 1909, to have signs of tubercle at both apices of the right lung and at the upper apex of the left. His weight was only 3 st. 6½ lb., or 12 lb. below

the average weight for his age. He had enlarged cervical glands and many carious teeth. My colleague, Dr. Willcox, kindly admitted him into St. Mary's Hospital, and treated him by continuous antiseptic inhalation. The carious teeth were extracted. He improved rapidly. When I examined him again on July 5th he had gained $3\frac{1}{2}$ lb. in weight, the dull areas were smaller, and the signs of active lesion had subsided. But his conditions of life are most unfavourable. On October 5th his weight was still 3 st. 10 lb., as in July; his cough had returned, and I found evidence of fresh implication of the left lung, the right lung being no more involved. Dr. Willcox kindly again admitted him into hospital, and he has once more improved and again gained weight. But one cannot but fear that the domestic conditions will prove too hard for him.

CASE 29.—MR. N., aged 28, sent by Dr. Wilson, of Boston, May 7th, 1909. Cough for six weeks; loss of weight, $2\frac{1}{2}$ lb. His sister, aged 25, died from phthisis after an illness of two years. Signs at all four apices and two lower areas, with some evidence of cavitation at the right apex. Gain of weight after three weeks of continuous antiseptic inhalation, 7 lb. A month later, after a stay at Margate, where he did not feel well, he was found to have lost 3 lb. The physical signs were stationary, but he had brought up some blood. This was due to bleeding gums round some very foul teeth. These teeth were extracted, and he again improved. On October 15th he was found to have gained 14 lb. since his first visit; there was no sign of activity in his dull areas of lung. He felt and looked very well, and was doing his full work without fatigue. He was dismissed as cured, but advised to wear his inhaler for two hours daily during the next three months.

CASE 30.—MR. R., aged 30, seen at his home in East Ham, with Dr. McKettrick, July 27th, 1909. Cough for two months; hæmoptysis, lasting several days, two weeks ago. Sputum mucoid. Extensive signs of tubercle in both lungs, at all four apices, and five other areas, with some signs of cavity at the right upper apex and moist crackles at the left lower. I formed a very unfavourable opinion of his prospects. We at once instituted treatment by continuous antiseptic inhalation. On October 16th Dr. McKettrick wrote to me that "Mr. R. is now in Devonshire, putting on flesh rapidly, and his lung condition has improved very much."

P.S., November 30th, 1909.—MR. R. wore his inhaler day and night persistently for a month. For eleven weeks he has lived in the open air at Lyme Regis. He has gained twelve pounds in weight, had hardly any cough and almost no expectoration, and has been able to climb the Dorset hills. There is still a cavity at his right apex with slight local tenderness and slight occasional local pain, but there is hardly any crepitant sound, and all his dull areas are much smaller. He feels well and hopes to resume work in January.

This is, I think, a complete list of all the cases of incipient or early pulmonary tuberculosis which I have treated by continuous antiseptic inhalation, and in which I have been able to watch the progress or to ascertain the result. Every one of these 30 cases has shown marked improvement. This is

surely a most encouraging fact. I consider 22 out of the 30 as certainly cured. In 13 of them the cure has stood the test of time, for they have all remained well and in active work for a whole year. These are Cases 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15 and 16. To these may probably be added Case 1. Eight other cases, Nos. 18, 19, 21, 22, 24, 25, 26 and 29, are apparently quite well, but they have not yet stood the test of time. Five cases—Nos. 10, 11, 17, 20 and 27—I look upon as nearly cured. Only 3 cases remain about which one feels any doubt as to the favourable issue; they are Nos. 23, 28 and 30, and all these three cases have improved very considerably.

In the later stages of pulmonary tuberculosis the treatment by antiseptic inhalation will sometimes relieve cough and diminish expectoration, but it cannot be expected to cure. Let no one make trial of this method in advanced phthisis and then report that he "has obtained negative results." Of course he will obtain negative results. When the whole house is burning the most strenuous efforts of the fire brigade may be powerless, yet at its beginning the fire might have been extinguished by a mere pailful of water. If we are to succeed in arresting pulmonary tuberculosis we must attack it in its earliest stage. At present cases are too often allowed to drift into a serious and even into an irremediable condition simply because the practitioner has not learned how to diagnose an early tuberculous infection by means of careful percussion. Yet this possibility is within the reach of all if a correct method be adopted. And here let me lay stress on the necessity for a complete relaxation of the patient's muscles. For the front of the chest, the patient must lie on his back on a comfortable couch and be placed completely at his ease. With the patient standing or sitting up it is impossible to ascertain the facts correctly, and some of the published pictures illustrating the "method of percussion," with the patient erect, are excellent examples of "how *not* to do it!" For the posterior aspect of the thorax, the patient should be sitting with his back to the physician; he should place his hands on the anterior aspect of the opposite shoulders, and should bend gently forwards.

In this paper I have endeavoured to maintain two propositions. The first is that the detection of pulmonary tuberculosis before any bacilli appear in the sputum is within the reach of any medical practitioner who is willing to take a little trouble. The second is that pulmonary tuberculosis detected at this stage can always be arrested by treatment by continuous antiseptic inhalation. It may be that some exception to both

these statements may be found, but if these two propositions can be established, or if they are even approximately true, it is not too much to say that the practical extinction of the disease known as pulmonary phthisis is within our grasp. Since the essential point is a careful percussion, we may say that the secret of success is very literally *in our own hands*. I believe that within three or four years an enormous reduction of the mortality might be effected.

Reprinted from the BRITISH MEDICAL JOURNAL, Dec. 25, 1909.

To the Editor of the BRITISH MEDICAL JOURNAL.

SIR,—In the paper on the physical signs of incipient pulmonary tuberculosis and its treatment by continuous anti-septic inhalations, published in the *Journal* of December 11, I stated that in only three cases out of the thirty narrated any doubt remained as to the final result; these were Cases 23, 28 and 30. May I now add that in all these three cases the doubt has been replaced by a practical certainty of cure?

I examined Case 30 again on November 30, and was able to report his great improvement in a postscript to my paper.

Case 28 was examined on December 7; he had gained $\frac{1}{2}$ lb. in weight, had no cough, and no evidence of active disease in his lungs. Arrangements have been made for him to live in the country for six months.

Case 23 was seen on December 16. He had gained 14 lb. in weight since I last saw him on May 8; he has no cough, and hardly any expectoration; his temperature has been normal or subnormal for the last three months. He can now walk from six to ten miles a day without fatigue. He still has a small cavity at his right apex, but the three other cavities have become obliterated, and there is very little morbid sound to be detected on auscultation. All his dull areas are smaller, and nearly all are quiescent. This patient has been under the care of Dr. J. R. Morton, of Bournemouth. He wore his inhaler persistently for five months, till the end of July. During July, August, and September he received weekly injections of tuberculin.

The change in his appearance was described by one of his friends as a "transformation," and the word is not too strong. He hopes before long to be able to resume his work. To

prevent any possible misunderstanding, it seems necessary to say that this case is the only one of the thirty who received any tuberculin injections, and that in this case they were not given by my advice.

May I also rectify an omission by stating that my paper was read before the Therapeutical Section of the Royal Society of Medicine on November 2, 1900, and that it will be published also in the forthcoming volume of their *Proceedings*?—I am, etc.

DAVID B. LEES.

APPENDIX II.

TWENTY CASES OF PULMONARY TUBERCULOSIS TREATED BY CONTINUOUS ANTISEPTIC IN- HALATION.¹

TWELVE months ago, on Nov. 2nd, 1909, I read before the Therapeutical Section of the Royal Society of Medicine a paper on "The Physical Signs of Incipient Pulmonary Tuberculosis and its Treatment by Continuous Antiseptic Inhalations."² In this paper I gave full details of the method of treatment advocated, and narrated 30 cases of incipient or early pulmonary tuberculosis in which it had been employed with success. Now that another year has elapsed I desire to record the present condition of these cases, and to add an account of 20 subsequent cases in which the same method of treatment has been used.

My summary of the results a year ago was as follows :

I consider 22 out of the 30 as certainly cured. In 13 of them the cure has stood the test of time, for they have all remained well and in active work for a whole year. These are Cases 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15 and 16. To these may probably be added Case 1. Eight other cases—Nos. 18, 19, 21, 22, 24, 25, 26 and 29—are apparently quite well, but they have not yet stood the test of time. Five cases—Nos. 10, 11, 17, 20 and 27—I look upon as nearly cured. Only three cases remain about which one feels any doubt as to the favourable issue ; they are Nos. 23, 28 and 30, and all these three cases have improved very considerably.

In a subsequent letter³ I stated that "in all these three cases the doubt has been replaced by a practical certainty of cure."

¹ Reprinted from *The Lancet*, November 19, 1910.

² The paper was published in the *British Medical Journal* of Dec. 11th, 1909, and also in the *Proceedings* of the Royal Society of Medicine.

³ *Brit. Med. Jour.*, Dec. 25th, 1909.

At the end of a year after the reading of my paper I have to report that of the 14 cases in the first group at least 12 are still quite well and in constant active work—these are Cases 2, 3, 4, 5, 6, 7, 9, 12, 13, 14, 15, and 16. About the two others (Nos. 1 and 8) I have no further information. Seven of the eight cases whom I classed as “apparently quite well” have remained quite well during the last year and in active work. These are Nos. 18, 19, 21, 24, 25, 26, and 29. The eighth (No. 22) had a slight relapse in December and January at a time when he had reduced the use of the inhaler to two hours daily and was working hard for ten hours a day. He lost $4\frac{1}{2}$ pounds in weight, the dull areas in his lungs became larger, and the air-entry feeble, with slight crepitus at his apices. But a fortnight in bed with persistent inhalation restored him. On March 8th, 1910, he had gained 9 pounds in weight, and his physical signs were much improved. On Oct. 26th, 1910, he writes that he has been continually hard at work since February, and that he is able to do his business without undue fatigue. He has still a slight cough.

Of the five cases—Nos. 10, 11, 17, 20, and 27—which I described as nearly cured, Case 10 wrote to me some months ago that she was quite well and could perform her duties without fatigue; about Nos. 11 and 17 I have no further information. No. 20 had a slight relapse in January, 1910, after having discontinued the inhaler for several weeks. A return to the treatment quickly produced an improvement, and she again gained weight, but signs of a small cavity in the outer and upper part of the right lung became evident. Under persistent treatment these signs progressively diminished, and in October, 1910, she is stated to be apparently quite well. Case 27 is unusually chronic, and has had pain in her right chest from time to time, but the physical signs are slowly but steadily improving. She has no cough and is increasing in weight.

Finally, as to the three cases Nos. 23, 28, and 30. No. 30 writes on July 9th, 1910: “It is exactly a year to-day that I was taken ill. My weight is 11 st. 7 lb.” [total gain $13\frac{1}{2}$ pounds]. “My breathing is very good, and I have a good appetite. I am enjoying very good health.” He has been actively at work. The little boy, No. 28, has remained quite well, and his physical signs are quite satisfactory. He has gained 7 pounds in weight. Case 23, the most severe of all the thirty except Case 3, writes on Oct. 25th, 1910: “I feel quite well. I have been back at business since April, and am stronger than when I returned. I feel no fatigue after the

day's work, and have played cricket and golf all the summer. When I returned in April my weight was 12 st. ; it is now 12 st. 4 lb."

CASE 31.—The patient, aged 69 years, was seen at his home, in consultation with Dr. Hickley of South Lambeth-road, on July 20th, 1908. Not a temperate subject. Had an operation for hæmorrhoids six months ago. Hæmoptysis for a week three months ago. Thinner lately, but had very little cough. Four days ago dyspnœa developed suddenly, and was found by Dr. Hickley to be due to pneumothorax on the left side. Gradual improvement took place, but when I saw him the left side was still to some extent distended and the heart displaced to the right. Dullness at all four apices, especially the two lower apices, with crepitation, blowing expiration, bronchophony, and audible whisper. Considering the age of the patient, the history of chronic alcoholism, the pneumothorax, and the marked evidence of pulmonary tuberculosis, the prognosis appeared to be almost hopeless. But he was advised to adopt the plan of treatment by continuous antiseptic inhalation (of which full details were published in my paper referred to above), in the hope of securing at all events some alleviation and improvement. Accordingly he practised continuous inhalation by means of a Yeo's inhaler for six weeks, during the first three of which he remained in bed. He then gave up the inhaler and went to the seaside for a fortnight. He then returned to business, and more than a year later (January, 1910) Dr. Hickley found that he was well and at work. In October, 1910, Dr. Hickley reported that he is still well, and leaves home for his business in the City every morning before half-past eight.

Case 32.—The patient, aged 38 years, came for advice on June 28th, 1909, on account of attacks of epigastric discomfort with flatulence and shivering, which had recurred about twice a week since he paid a visit to New York three years before. No vomiting, hæmatemesis, or melæna. Smoked "a good deal." Moderate dilatation of the stomach was found on examination, and in addition it was noticed that small dull areas were present at both apices of the left lung only. He had a short rather frequent cough. On August 10th he was no better, and had lost 2 pounds in weight ; the dull areas at the apices of the left lung were larger and a little crepitus was detected, but the right lung was still normal. On Sept. 27th the condition was unaltered, and lavage of the stomach was advised. This was performed by Dr. Bindloss of Harrow, and gave much relief. On Nov. 3rd the stomach was found less distended, but the shivering attacks continued, and the possibility of malaria was considered. The spleen was normal. He had lost 3 pounds in weight. There was no cough or sputum, but fresh signs of tubercle were found in the right lung, as well as in the left, with tenderness and crepitus. A blood examination by Dr. Spilsbury showed "red corpuscles, 5,400,000; hæmoglobin, 110 per cent. ; white corpuscles, 3900 (polymorphonuclears, 48 per cent. ; small mononuclears, [lymphocytes], 48 per cent. ; large mononuclears, 4 per cent.)" and the conclusion was drawn that the absence of anæmia was against the idea of malaria, while the increased proportion of lymphocytes was in favour of tuberculosis. A little sputum was obtained, and found to contain epithelial cells and some pneumococci, but no tubercle-bacilli. The opsonic

index to tubercle was found by Dr. Parry Morgan to be 1·15. On Nov. 11th I saw the patient at his own home in consultation with Dr. Bindloss, when we again found the dull areas in both lungs. He was kept in bed and used continuous antiseptic inhalation (as above defined), the inhaler being removed only at meal-times. Four grains of quinine were administered three times a day. On Nov. 18th no more shivering had occurred, and the dull areas were all distinctly smaller. On the 30th, the treatment having been continued, he was found to have gained 6 pounds in weight, the dull areas were still diminishing, and no more shivering had occurred. There was still a little fine crepitus at the apices. He continued the persistent inhalation for three weeks longer, and on Dec. 20th had gained 1½ pounds more. Omission of the quinine was followed by a slight relapse of shivering and gastric symptoms, but in February, 1910, he wrote: "I am feeling better and weigh 10 st. 1½ lb."—a further gain of 1½ pounds, or 9 pounds in all. In October, 1910, he wrote that he had done his full work since January, that his digestion was now "almost perfect," that the shivering attacks had gradually become less frequent and had been absent for the last five weeks, and that he coughed only when he "caught cold." His weight was now 9 st. 11½ lb. in summer attire.

CASE 33.—A patient, aged 39 years, of Dr. R. H. Wilkin, Wickhambrook, Newmarket, seen on Oct. 13th, 1909. He had had cough two years; hæmoptysis 14 months ago; has not worked since; dyspnœa 12 months; night-sweats; and weight fell from 11 st. 11 lb. to 10 st. 9 lb. Then he improved, lost his night-sweats, and gained weight; but a fresh hæmorrhage occurred three months ago. His weight now was 10 st. 13 lb.; there were dull areas at all four apices, especially at those on the right side; feeble air-entry, with a little crepitus, but no bronchial breathing or audible whisper. Clearly he had offered considerable resistance to the disease; hence further improvement might be hoped for in spite of the long duration. He was treated by continuous antiseptic inhalation. I did not see him again until June 15th, 1910, when he reported that he had worn the inhaler about 20 hours daily for five months, and 18 hours daily for the last three months. He had improved at once and steadily until a month ago, when sudden cold east winds increased his cough. He felt much better, slept well (before using the inhaler he was often kept awake by cough until 2 a.m.), enjoyed his food, and had no indigestion. He looked well, and coughed once only during the examination, but he had lost 3 pounds in weight. His dull areas were distinctly smaller, and hardly any crepitus could be detected. In October, 1910, Dr. Wilkin wrote that the patient was "just holding his own," and that he had not again lost weight, but that he still coughed a good deal and expectorated occasionally. He was not yet able to do even half a day's work.

CASE 34.—A patient, aged 30 years, of Dr. J. W. Ellis, of Swavesey, Cambridge, seen on Oct. 18th, 1909. He had been ill eight months; recurrent slight hæmoptysis; "brings up thick phlegm." Teeth very decayed and foul. Large areas of dullness at all four apices and several lower areas. Tenderness, very feeble air-entry, marked crepitus, and some bronchial breathing and audible whisper. The disease was extensive and advanced; the prognosis appeared to be grave. He was very feeble and looked very ill. Under continuous antiseptic inhalation,

carried out under special difficulties and rather imperfectly, he improved steadily. On Nov. 13th, 1909, he had gained 5 pounds in weight in three weeks, the dull areas were smaller, and less crepitus was present, with hardly any bronchial breathing or audible whisper. On Dec. 18th he had gained 2 pounds more (7 pounds in all), and the physical signs were still improving. On Feb. 24th, 1910, he was going on well, and had almost lost his cough, his appetite had improved, and he had been able to do two or three hours' work every day. No crepitus could now be detected in his lungs. On October, 1910, he wrote: "I am able to do my work from about 6 o'clock in the morning until about 5.30 at night," but that he weighs 7 pounds less than in February. He had not used his inhaler much of late, and had given up the malted milk. His cough was variable, but at present better.

CASE 35.—The patient, aged 31 years, unmarried, was brought by Dr. J. Ashton of St. John's-hill, Battersea, on Nov. 16th, 1909. She had had cough for six months at least, slight hæmoptysis four months ago. Appetite poor. Dullness at all four apices, and four lower areas, with crepitus, but no bronchial breathing or audible whisper. After treatment by continuous antiseptic inhalation for a fortnight she stated that the cough was "ever so much better," and she had gained $2\frac{1}{2}$ pounds in weight. The physical signs had already begun to improve. Unfortunately, in December she had an attack of colitis, which reduced her strength, and the inhalation was less regularly employed. In February her cough became worse, and it was found that all her dull areas were larger. She was therefore kept in bed for a fortnight, and the inhaler was used persistently except at meal-times. This soon checked the cough, which had become severe, and she looked brighter, but she had lost a pound in weight, and the dull areas were still slowly increasing. The situation of her home in London was such that it was difficult to obtain sufficient fresh air, so she was sent to Ventnor, where the windows were kept widely open and she used the inhaler continuously. After five weeks she returned much improved, and the inhalation treatment was again reduced. Her condition once more became less satisfactory. But a return to more thorough treatment again produced an improvement, and when I saw her on Oct. 2nd, 1910, she had gained $3\frac{1}{2}$ pounds in the last seven weeks, and the physical signs were much more satisfactory. Total gain, $7\frac{1}{2}$ pounds. She is to spend the winter at Arosa in Switzerland under medical observation, and is to practise antiseptic inhalation eight hours a day for the first two months and six hours a day subsequently.

CASE 36.—The patient, aged 53 years, married, was sent by Dr. G. A. Simmons of Westminster on Nov. 19th, 1909. She had had short hacking cough on and off for four years, with occasional streaks of blood and small clots in the expectoration. Her mother had died from phthisis at 52, and an uncle and two aunts had died from the same disease, in two cases after only a few weeks' illness. Dullness was present at all four apices and several lower areas, with extensive crepitus and apical tenderness. She was advised to remain in bed for ten days and practise continuous antiseptic inhalation. This was carried out, but the calls on her time were such that subsequently she could not use the inhaler more than two hours daily. She visited me again three months later (Feb. 15th, 1910), when I found that she had gained 9

pounds in weight, that the dull areas were all smaller, that the tenderness had entirely disappeared, and that no crepitus could be heard. I have not seen her again since February, 1910, but in answer to my inquiry, Dr. Simmons writes (Oct. 13th, 1910): "Mrs. — recovered completely, as far as could be made out, from her lung trouble; but she died about three months ago from cerebral hæmorrhage."

CASE 37.—The patient, aged 28 years, married, was seen at her home in consultation with Dr. Ashton of Battersea on Dec. 14th, 1909. Cough, called "nervous," for four years. No hæmoptysis. The cough became bad and accompanied by expectoration seven months ago. *She had been treated for six months by tuberculin injections given regularly every week.* When Dr. Ashton was called to see her in November, 1909, she was exceedingly ill, seemed collapsed, and had a temperature of 103° F. He at once stopped the inoculations, and suggested that she should adopt the treatment by continuous antiseptic inhalation as advised for Case 35. This was begun on Nov. 17th, 1909. Improvement followed immediately. After a fortnight the temperature had fallen to 101°, after a second fortnight it was normal. Her condition improved rapidly and steadily. When I saw her with Dr. Ashton on Dec. 14th, 1909, she was sitting up in bed, happy and smiling. Her husband and her mother bore testimony to the extraordinary improvement in her condition. I found extensive signs of tuberculous pulmonary disease and evidence of a pleural effusion on the left side. This was aspirated by Dr. Ashton and a pint of clear serous fluid was withdrawn. After this there was further improvement and she was able after a while to go out of doors.

More than four months later, in May, 1910, Dr. Ashton sent her to my house for an opinion about a small swelling at the site of the aspiration, from which pus exuded. I found that there was still much dullness and absence of breathing at the left axillary base in the neighbourhood of this opening, that the left side was very little used in respiration, and that there were signs of a dry cavity at the right apex. She was admitted into St. Mary's Hospital through the kindness of my colleague Dr. Willcox, and small pieces of the eighth and of the ninth ribs were removed by Mr. Clayton-Greene, and a drainage-tube inserted. Her general condition improved after this operation, and she returned home, but the discharge continued and she gradually grew weaker. Four months later she was readmitted into St. Mary's Hospital in a moribund condition. A necropsy was made by Dr. Spilsbury on Nov. 9th, 1910. The left lung was quite collapsed. Its upper lobe was wholly converted into a branching cavity. A smaller cavity existed below the apex of the left lower lobe, which had ruptured into the left pleura; the rest of this lobe was collapsed. The right upper lobe was universally adherent to the pleura and contained a large cavity. A smaller cavity existed below the apex of the right lower lobe. Much old fibro-caseous tubercle in base of upper lobe and in the middle lobe. Only the lower half of the right lung could have been capable of respiratory function. No caries of rib.

CASE 38.—The patient, aged 23 years, unmarried, was sent to me on Dec. 18th, 1909, by Dr. C. J. Horner of Walthamstow, who had read my paper already referred to. She had had cough about a month, occasional night-sweats, loss of weight, some pyrexia (to 100° F.), and

occasional pain at the left posterior base. Slight dyspepsia. No hæmoptysis. Her weight now was 8 st. $1\frac{1}{2}$ lb.; two years ago it was 8 st. 10 lb. Dullness at all four apices, and two lower areas in the right lung, with poor air-entry but no crepitus, no prolonged expiration, and no audible whisper. Marked dullness, and distinct pleural friction-crepitus at the left posterior axillary base. Under treatment by continuous antiseptic inhalation her cough ceased within a week, and there were no more night-sweats. The inhaler was worn persistently. On Jan. 18th, 1910, she had gained $3\frac{1}{2}$ pounds in weight; there was better air-entry and very slight crepitus at the end of inspiration; the friction at the left base had now disappeared, and the area of dullness at this place had resolved itself into two separate dull areas. She felt so much better that she desired to go back to her work as a teacher. On Jan. 30th, 1910, she looked well and had a good colour. She felt quite well, the dyspepsia had disappeared, and no cough since the last visit. She had gained 3 pounds more in weight. The dull areas were all much smaller; a little occasional crepitus could still be heard. She was permitted to return to work. On Feb. 25th, 1910, she had gained 2 pounds more, making a total gain of $8\frac{1}{2}$ pounds, and had now her normal weight of 8 st. 10 lb. She had done her full work as a school-teacher for a month without fatigue. She was advised to use the inhaler six hours a day for three months longer and to practise breathing exercises.

CASE 39.—The patient, aged 29 years, was sent by Dr. Hingston of Liskeard on Jan. 29th, 1910. He had had cough for some months; no hæmoptysis. His father died from phthisis at 64; a brother died from the same disease at 35. Dullness at all four apices and four lower areas; poor air-entry and slight crepitus, but no prolonged expiration or audible whisper. Weight now 12 st. $4\frac{1}{2}$ lb.; he formerly weighed 13 st. Under continuous antiseptic inhalation he improved at once. On Feb. 22nd, 1910, he felt "much fitter, in fact quite well," had lost his cough, and had gained $6\frac{1}{2}$ pounds in weight. His dull areas were all smaller, there was now good air-entry at the left apex, rather poor entry at the right apex, with slight prolongation of expiration at the right apex posteriorly, and slight tenderness and some inspiratory crepitus at the right lower apex; no other morbid sounds. On March 22nd, 1910, he felt "extraordinarily well" and "better than he had felt for two years." Had inhaled for eight hours daily and at night. The physical signs showed further improvement. In April and May he travelled to Egypt and the Mediterranean, still using his inhaler on an average four hours daily. He ascended the Great Pyramid so fast that he tired out his Arabs, and felt "perfectly fit" after an hour's "very hard climb" on Vesuvius. As the result of this hard exercise his weight had fallen to 12 st. 2 lb., but he felt and looked very well. On July 23rd, 1910, he stated that he was quite well and had walked twenty-eight miles without fatigue.

CASE 40.—The patient was a clergyman, aged 47 years, sent by Dr. T. G. Lithgow of South Farnborough, on Jan. 30th, 1910. "Caught cold" in October, 1909 (had been regularly visiting one of his parishioners suffering from phthisis who died in March, 1910); felt very ill during the week following Christmas. "Very violent cough with heavy yellow expectoration, and a few streaks of blood" during the last three weeks. Dull pain over his chest lately, and several attacks of severe dyspnoea

had occurred, lasting from 10 to 15 minutes. His appetite was poor, he slept badly, and felt quite unfit for work. I found large dull areas at all four apices, and four lower areas, with poor air-entry but only slight crepitus, indicating an extensive pulmonary tuberculous infection but in an early stage. There was obvious dyspnoea during the examination, with deep breaths and frequent short cough. His nervous tone was very low, he started when gently percussed, and his knee-jerks were much exaggerated. Some years previously he had experienced a "nervous breakdown," and of late excess of study and hard work, with other unfavourable circumstances, had much reduced his strength.

The prognosis appeared to be extremely gloomy. He was advised to go to bed at once on his return home, to practise continuous antiseptic inhalation, and to take milk and malted milk at frequent intervals. On the sixteenth day of his use of the inhaler his wife made the following note: "Temperature nearer normal; sleep natural (seven hours); cough much less; pain in lung gone; catarrhal condition almost gone; emaciation (of face) less; breathlessness better; hearing better; nervous irritation gone; mental depression better." On Feb. 23rd, 1910, Dr. Lithgow reported: "He came downstairs yesterday and feels better. No cough while wearing inhaler, but fresh air seems to irritate. Temperature has on five occasions since 30th Jan. been barely 99° F.; never above. Dyspnoea less." I found that he had gained 4½ pounds in weight; that his nervous tone was better; that nearly all the dull areas were smaller; that there was more entry of air and very little crepitus. He was advised to apply for six months' leave of absence, but to remain at home for the present, using the inhaler persistently in his own house and garden.

On March 16th, 1910, he had gained an additional 5 pounds (or 9½ pounds in all); his physical signs were still improving, and no sign of breaking down of lung had appeared. As he complained of heartburn, a mixture containing bicarbonate of soda, bismuth, and eight drops of tincture of nux vomica three times daily was prescribed. (Dr. Lithgow had previously given him three minim doses of liq. strychnin, thrice daily for three or four weeks.) On April 6th Dr. Lithgow wrote that "after some jerkings 12 days ago he discontinued the medicine, but on April 2nd both legs were convulsed and the right arm, with risus sardonius of right side of face. A squint is said to have been noticed, and there has been a dislike of bright light. Pupils normal. Urine clear, 1015, acid, no albumin." On April 14th I saw him at his home in consultation with Dr. Lithgow, as the attacks of spasm had recurred and double (convergent) squint had been observed. I found that there had been no headache, vomiting, delirium, hallucinations, constipation, or pyrexia. The urine was normal. It was now three weeks since the nux vomica was omitted, yet the spasmodic attacks were more frequent though less severe. The double squint, when it occurred, was convergent. The contact of the stethoscope, also tickling of the sole, made him start. Knee-jerks moderately increased; no clonus. Sensation normal. Cough had almost entirely ceased, and the physical signs were very satisfactory. We concluded that the nervous symptoms were not due to strychnine, were not indications of tuberculous meningitis, and were not uræmic. They were obviously the expression of a functional neurosis. Massage was ordered. On April 17th a marked change for the better was reported and the improvement was maintained. On May 6th Dr. Lithgow stated that he was

"still improving." In October, 1910, Dr. Lithgow informed me that he was still making progress, but that his nervous tone was not yet normal.

CASE 41.—The patient, aged 23 years, was brought to me by Dr. G. D. Pidcock of Hampstead, on Feb. 7th, 1910. In August, 1909, while on the Continent he had a severe "cold," with coryza and cough, which made him feel "run down." In October slight hæmoptysis occurred; it lasted about a week. The sputum was then examined by Dr. Pidcock, and tubercle bacilli were found. A physician who examined him found no physical signs in his lungs, but advised that in view of the discovery of the bacilli, he should be sent to Ventnor and live as much as possible in the open air. This was done. When I saw him some weeks later there was dullness at all four apices and several other areas, with poor air-entry at the left apex, some crepitus at the right apex and at both lower apices, with a little audible whisper at the left upper apex posteriorly. He was advised to adopt the treatment by continuous antiseptic inhalation, but at first it was very imperfectly carried out, and when I saw him again on March 24th he had lost 4 pounds in weight and all his dull areas were larger, though there was still hardly any cough. He consented to make a more thorough trial of the inhalation method, remained in bed for a fortnight, and wore the inhaler persistently for four weeks. On his third visit, on April 22nd, he had gained $4\frac{1}{2}$ pounds in weight and his physical signs were much improved. On June 18th he stated that there had been no cough or sputum since the last visit, and that he felt quite well. Dr. Pidcock states that when the sputum was last examined it contained "only a few bacilli, and these were all clumped."

CASE 42.—The patient, aged 35 years, unmarried, was seen on Feb. 18th, 1910. She had suffered from "hay fever" every year for the last three years. Had had "a little cough lately," and a short cough occurred three times during the examination. She was found to have moderate areas of dullness at all four apices and some lower areas, with feeble air-entry, and over the largest dull area (at the right lower apex) there were some tenderness, slight double crepitus, and some prolonged expiration. Under continuous antiseptic inhalation she began at once to improve. On March 11th she had gained 4 pounds in weight in three weeks; all her dull areas were smaller, and the tenderness at the right lower apex had disappeared. She was advised to inhale eight hours daily for four weeks longer. On April 15th she felt better and had gained 3 pounds more (total gain 7 pounds); the cough was now very slight and only before breakfast, and the physical signs were less marked. On May 21st she felt very well, had no cough and no sputum, and her appetite was good. She was advised still to wear her inhaler four hours daily, and all day long if an attack of hay-fever should occur. A letter from her, dated Oct. 11th, 1910, says: "I am still using the inhaler for two or three hours a day; it has been a great boon to me when I have had the beginnings of hay-fever . . . and I wish that so simple a treatment were more widely known."

CASE 43.—The patient, aged 31 years, unmarried, was sent by Dr. Simmons of Westminster on Feb. 25th, 1910. She had had cough more or less for two years, worse for some months. No hæmoptysis. Had lost 6 pounds in weight. A brother died from phthisis at 26, and a

sister at 14. Many dull areas were present, the largest being at the right upper and lower apices. Poor air-entry, some prolonged expiration, some crepitus, and audible whisper at the right apex, where cavitation appeared to be developing. She obtained three months' leave of absence from her duties, remained in bed for three weeks, and used the inhaler night and day. I saw her a second time on April 6th; she had gained 4 pounds in the six weeks, all her dull areas were smaller, and the condition of the right apex was much more satisfactory. She came to me a third time on May 13th; she had gained $2\frac{1}{2}$ pounds more, making a total gain of $6\frac{1}{2}$ pounds. She looked well, and her physical signs were further improved, but she still coughed occasionally. She was advised to use the inhaler at night and for six hours daily for three weeks longer; at the end of this time to return to work and practise inhalation three hours every evening and at night.

CASE 44.—The patient, aged 28 years, was brought by Dr. J. L. Forrest of Terrington St. John, Wisbech, on March 23rd, 1910. Four years ago he had plenrisy on the left side. Cough since December, 1909. "Influenza" in February, 1910, after which his cough became worse, and he brought up sputum; this had been found to contain "a considerable number" of tubercle-bacilli. He was very depressed and thought that as he was consumptive he must certainly die. His normal weight was 10 st. 12 lb., but he now weighed only 10 st. 1 lb. Dullness at all four apices (large areas at the right upper and lower apices and at the left lower) and four lower areas. Air-entry practically absent over the dull apices: slight crepitus here and there, but no sign of cavitation. He was advised to remain in bed for two weeks and to practise continuous antiseptic inhalation, and was reassured as to his prospects of recovery. On April 23rd Dr. Forrest wrote: "He is much improved; he put on 7 pounds weight in three weeks, and says he now feels very fit indeed. For ten days the temperature was 99° F. in the evening; now it never exceeds 98.6° in the evening and is 98° in the morning. Cough and expectoration now very slight." On May 4th Dr. Forrest reported: "He had a slight rigor two days ago and the temperature rose to over 100° , so he is to be kept in bed a few days. Sputum examined again; report states that tubercle-bacilli are fewer than six weeks ago." I saw him a second time on May 18th, when I found that he had gained $12\frac{1}{2}$ pounds in eight weeks, all his dull areas were smaller, there was now good air-entry everywhere, but there were some indications of cavitation at the right upper and lower apices (where the largest dull areas were situated). He was advised to use the inhaler not less than six hours daily, and, if possible, at night. He acted on this advice and when he presented himself for the third time on August 17th, I found that in the three months he had gained 2 pounds more (total gain $14\frac{1}{2}$ pounds), that he felt better, and could do more work without fatigue. He complained that his cough was still troublesome for periods of about four days at intervals of about three weeks, and that at these times he brought up yellowish sputum. His dull areas were all much smaller, and the cavities slowly contracting; no active signs. He was advised to persevere. His weight was now 11 st. $1\frac{1}{2}$ lb.

CASE 45.—The patient, a boy, aged $6\frac{3}{4}$ years, was seen at his home in consultation with Dr. J. E. B. Wells of Hoddesdon on April 10th, 1910.

At the age of only 11 months a mass of tuberculous glands pressing on the trachea had been removed by operation. He was "a delicate, bright, intelligent child with very carious teeth, poor appetite, cough (worse at night), an evening rise of temperature (which has been twice followed by profuse sweating), and a morning fall of about 2° F. The sputum has been examined; it contains no bacilli." A linear scar was present on the left side of his neck. A few small cervical glands could be felt. Dullness existed at the left apex in front and at all the characteristic areas posteriorly. Some crepitus could be heard in the left upper lobe and at the angle of the left scapula. The abdomen was normal. It was advised that he should be persuaded to wear a Yeo's inhaler and to practise continuous antiseptic inhalation for a month. On April 28th Dr. Wells wrote that the boy had taken kindly to the inhaler and that he had greatly improved. "Temperature nearly constantly normal for three days; eating well and putting on flesh. The cough is gone, as well as the sweating at night." Three months later (August 9th) he was brought to my house on his way home from Margate, where he had spent ten weeks, and had had no cough during the whole of this time. The characteristic small areas of dullness could still be demonstrated (including now the right apex also), but no morbid sounds.

CASE 46.—The patient, aged 30 years, unmarried, was seen on April 12th, 1910. She had given much time to athletic sports (tennis, hockey and golf), and won prizes and championships. In 1908 she had influenza and some months later she was found to have dilatation of the heart. This was treated by baths and exercises and recovery followed. She had had a cough for more than a year, and frequently brought up a small amount of sputum, which was often slightly blood-stained. For several months her evening temperature had been 99° F. The sputum had twice been examined for bacilli but none were found. Her weight now was 8 st.; she once weighed 8 st. 9 lb. She thought that she had lost half a stone this winter. Dullness was present at all four apices and some lower areas. Air-entry at apices poor, and slight crepitus could be heard here and there, and at one spot a little prolongation of expiration, but no audible whisper. She was advised to remain in bed for two weeks and to practise continuous antiseptic inhalation. On May 4th she had gained 6 pounds in three weeks, looked and felt better. Her temperature, which had been 99.6° F. at first, gradually fell, and for three days had been normal. Cough better, dull areas smaller, air-entry more free, still a little crepitus. On her way home she caught cold from draughts in the train on a cold day, and her temperature rose to 99°. Yet on June 8th she was still improving, and had gained 4 pounds in weight in five weeks. Total gain, 10 pounds; present weight, 8 st. 10 lb.

CASE 47.—The patient, aged 21 years, was seen at a nursing home in Devonshire-street in consultation with my colleague, Mr. V. Warren Low, F.R.C.S., on April 28th, 1910. He had been admitted into the home under the care of Mr. Low two days before on account of a tuberculous knee, for which he had been under treatment for a considerable period in a large town in the Midlands, and the opinion had been finally expressed by a well-known surgeon that amputation was the only course by which life could be saved. For eleven months he had also suffered

from cough, and for the last six weeks the cough had been very distressing. He brought up a copious expectoration, chiefly mucoid. Temperature 102° F. on his admission; it rose to 103° , and was now 101.8° . The right knee was much enlarged and tensely swollen, and was very painful. His cough was frequent, and whenever he coughed an expression of pain was seen on his face, the inflamed knee being jarred by the effort of coughing. His condition was, indeed, most distressing, but Mr. Low had been able to give some relief by the application of a Von Bier's elastic bandage round the upper part of the thigh. The patient's condition made it difficult to examine his lungs accurately, but I found that he had large dull areas at all four apices and some lower areas. Crepitus could be heard, especially at the lower apices, but no definite evidence of cavitation. It was advised that he should practise continuous antiseptic inhalation, and be fed freely with milk and malted milk, while the treatment by repeated applications of the elastic bandage (which always gave relief) was continued. Mr. Low and I agreed that in his present condition amputation would be fatal. Under the use of the inhaler the cough was at once relieved, and it almost disappeared within a few days. His knee progressively improved, and after a month (May 24th), he was sent back home with the leg on a splint, and his medical man was requested to continue the employment of the elastic bandage three times a day. In July a little pus was found to be exuding from the outer side of the knee, and a consulting surgeon was called in. His opinion was that the joint was disorganised and full of pus, and that immediate excision or amputation was necessary. Arrangements were to be made for the operation on the next day, but the patient refused to allow anyone but Mr. Low to operate on the joint, so his father brought him up again to the nursing home in Devonshire-street. Here his temperature was found to be 98.6° F., and the chart showed a subnormal temperature during the whole of the last week, including the day on which the surgical opinion was given. The knee was obviously much smaller than in April, it was not tense, or painful, or tender. The small discharging cavity was examined with a probe and found to be separated from the joint. Mr. Low was of opinion that suppuration had occurred in a bursa about the head of the fibula. The patient's general appearance was greatly improved, he was stouter in the face and looked happy and smiling, he was free from pain and had hardly any cough. I found that all his dull areas were much smaller, that there was poor air-entry and slight crepitus at his right apex, and some suspicion of cavitation at his left apex, while the crepitus at his lower apices had disappeared.

On Oct. 16th Mr. Low kindly informed me that this patient is still progressing satisfactorily, that he has no cough at all, and that his temperature has been normal for several months.

CASE 48.—The patient, aged 29 years, was sent by Dr. T. Gash of Rochester on May 17th, 1910. Five years ago he suffered from "pneumonia"; he was in bed for six weeks, and was "tapped twice," a pint of *clear* fluid being withdrawn on each occasion. It can hardly be doubted that this was really a tuberculous attack. In July, 1909, he had "influenza," and Dr. Gash detected evidence of tuberculosis of the lungs and prescribed treatment by continuous antiseptic inhalation in accordance with the recommendation in my paper. (His weight was then 9 st 13 lb.) He had accordingly used the inhaler for 17-18 hours

a day for four and a half weeks. More than a year ago he lost his first child at the age of 11 months from "meningitis." The second baby is now dying from "tuberculous mediastinal glands"; the glands under the jaw were first affected. When I examined this patient he had already gained $4\frac{1}{2}$ pounds in weight. The dull areas in his lungs were very extensive, and there appeared to be cavities at both apices and also at the left lower apex. On June 11th, 1910, he had gained $4\frac{1}{2}$ pounds more, his dull areas were smaller, and his cavities drier; very little crepitus now audible. Hardly any cough. By his own desire he now spent three weeks in Crooksbury Sanatorium, under the care of Dr. F. R. Walters, who kindly permitted him to wear his inhaler for 15 hours every day. On July 11th there was a further gain of $2\frac{1}{2}$ pounds and a further improvement in his physical signs. On Oct. 6th it was found that the cavities were practically healed and very little abnormal sound was heard. Cough and sputum very slight. Total gain in weight 12 pounds. He had not used the inhaler for a month and could do a day's work on his farm without much fatigue.

CASE 49.—A patient, aged 26 years, of Dr. E. B. Randall of Forest Gate, was sent to me on May 23rd, 1910, by a previous patient (Case 38). Dr. Randall wrote: "Her brother, aged 23, died of phthisis six months ago, and she has had a cold and cough on and off since, but came to me with a fresh cold in March, and her cough has continued; there are tubercle-bacilli in her sputum." Her weight was 7 st. $9\frac{1}{2}$ lb. There were rather large dull areas, with double crepitus at the right apex, and inspiratory crepitus at the left. Under treatment by continuous antiseptic inhalation her cough diminished quickly and the sputum became much less. On June 13th she had gained 5 pounds in three weeks, all the dull areas were smaller, much less crepitus was heard, but there were indications of a small cavity at the right apex. She continued to use the inhaler at night and more than eight hours in the daytime. On July 11th she stated that the cough and sputum had nearly disappeared, and there was a further gain of 5 pounds. The physical signs showed further improvement. On Sept. 27th she had gained 6 pounds more, making a total gain of 16 pounds; her weight was now 8 st. $11\frac{1}{2}$ lb. She had had no cough and no sputum for several weeks. Had walked eight miles without fatigue. Had a good colour. Felt and looked exceedingly well. She was full of gratitude for her recovery and said, "I feel I want to tell everybody about it!" She was still in mourning for the brother who had died from the same disease.

CASE 50.—The patient, aged 22 years, was seen at her home in consultation with Dr. H. Tipping of Palmer's Green, on June 7th, 1910. Her cough began in November, 1909, and she was then found to have tubercle-bacilli in her sputum. She progressed fairly until four weeks ago, when the cough became worse. She had lost over 7 pounds in weight, had vomited after coughing, and her temperature had been of hectic type— 99° to 100° F. in the morning and 102° (twice 103°) in the evening. During the last eight days she had practised continuous antiseptic inhalation, but had renewed the solution on the inhaler only three or four times in the 24 hours; yet the cough had ceased while she wore it. She was found to have rather large areas of dullness, with crepitus, at all four apices, and other dull areas, but no sign of

cavitation. She was advised to continue the treatment and to renew the solution on the inhaler regularly every hour during the daytime. I have not seen this patient again, but Dr. Tipping informed me that gradual improvement followed. In about 10 days the temperature fell to 98°-99° (morning) and 100° (evening). Signs of a small cavity developed at the right apex. On July 14th hæmoptysis occurred and lasted for 48 hours, and on the 17th again for 32 hours, then it ceased. Absolute rest was advised. In September Dr. Tipping wrote that she had continued to improve, her lung condition showed an "all-round improvement," but a cavity was still present. She was now walking about quietly. In October she "continues to improve, her weight is increasing; she coughs only at night and in the morning. Is doing light house-work."

The 30 cases reported in my first paper were all incipient or comparatively early cases, though three or four of them were very acute and rapidly advancing when the treatment was instituted. In every one of these 30 cases the result is highly satisfactory. Some of the 20 additional cases now reported came under treatment at a much later stage of the disease or were attended with grave complications. In such instances recovery must be comparatively slow, and the final issue may be doubtful. Any case of pulmonary tuberculosis, if allowed to progress unchecked for many months, may easily reach a condition which is incurable by any form of treatment. But my contention in these two papers is that this ought never to be allowed to happen. Pulmonary tuberculosis is recognisable and ought to be discovered before there is any breaking down of lung tissue. To suspend the diagnosis until tubercle bacilli are detected in the sputum is like delaying the diagnosis of cancer until the glands are involved.

APPENDIX III.

A THIRD SERIES OF TWENTY CASES OF PULMONARY TUBERCULOSIS TREATED BY CONTINUOUS ANTISEPTIC INHALATION.¹

IN a paper read before the Therapeutical Section of the Royal Society of Medicine on November 2nd, 1909, and published in the *Proceedings* of that Society, and also in the *British Medical Journal* of December 11th, 1909, I advocated the treatment of incipient and early pulmonary tuberculosis by means of continuous antiseptic inhalation, and narrated 30 cases in which it had been employed with success. In a second paper, printed in the *Lancet* of November 19th, 1910, I related 20 additional cases similarly treated; some of these were advanced or complicated cases. I desire now to record a third series of 20 cases, making a total of 70 cases treated by the method of which full details were given in my first paper.

CASE 51.—A patient, aged 26, a draper's assistant, was sent to me by Case 3, July 29th, 1910. His sister died seven years ago from phthisis at the age of 23 years after eight months' illness. He had suffered for eighteen months from repeated "colds" and frequent cough, with occasional slight hæmoptysis. In March, 1909, he entered a sanatorium and remained in it twelve weeks (weight on admission 10 st. 1 lb.—it rose to 10 st. 12 lb., but fell again to 10 st. 8½ lb.). Since June 20th, 1909, he had been at work, and had again "caught cold." His cough and sputum were as troublesome as before he entered the sanatorium, and his weight was only 9 st. 12 lb. Cough was frequent, short, and loose—he expectorated into a flask. He looked wasted, worn, and ill. All the characteristic dull areas of pulmonary tuberculosis (as described in my first paper) were present, and those at the left upper and lower apices were specially large. Over the whole left upper lobe in front and at both lower apices there was marked crepitus on inspiration, and very defective air entry at the right upper apex.

¹ Reprinted from the *British Medical Journal*, April 6th, 1912.

He was advised to remain in bed for two weeks and practise continuous antiseptic inhalation in the method and with all the details mentioned in my first paper. I saw him a second time on August 15th, 1910; he had then lost another pound, the weight having fallen to 9 st. 11 lb. But his cough was less troublesome, his sputum less profuse, his dull areas distinctly smaller, and the pulmonary crepitant sounds were much diminished.

He persevered with the treatment, and on September 26th, 1910, was much better, felt "quite a different man." Cough was "very much better," and sputum "very much less." His evening temperature was still about 99.4° F. (morning 97.8° F.). His weight was still 9 st. 11 lb., but he felt very much stronger, and no longer fatigued by walking. "Felt as if he would not recover at the last visit, but now feels that he is getting well." The physical signs showed an increased improvement. Had not been able to wear his inhaler at night. He spent the next four months at Southbourne, wearing his inhaler about eight hours out of the twenty-four, but the weather was unfavourable and he had uncomfortable lodgings. When I saw him again (February 23rd, 1910), he had lost 4 lb., but the pulmonary signs were no worse, and he had hardly any cough. During the next month he gained 2½ lb., but after this there was a steady loss. Of late he had used his inhaler only five hours daily. He was urged to remain in bed for a fortnight and inhale continuously day and night. Some temporary improvement followed. In August he was admitted into Ventnor Hospital. Dr. Robertson, of Ventnor, has kindly informed me that he "died from tuberculous meningitis on September 1st, 1911, although he had gained 5 lb. up to the onset of cerebral symptoms, and in other respects was doing well."

This patient's personal and family history were extremely unfavourable, and the treatment by inhalation was imperfectly carried out. Yet he obtained very considerable relief.

CASE 52.—A young man of 25, whose pulmonary symptoms had existed for two years before I first examined him on August 18th, 1910, and who had been in a sanatorium for eight and a half months (February-October, 1909). During the first five months of his stay in the sanatorium he gained no weight, but in the last three and a half months his weight rose from 11 st. 7 lb. to 12 st. 6 lb. Since his discharge he had been living in an open-air shelter at the seaside. He came to me on August 18th, 1910, on account of a "feverish cold," renewal of cough, and marked wasting. His weight was 11 st. 6½ lb.—½ lb. less than when he entered the sanatorium. He was found to have two cavities in the upper lobe of the left lung, and extensive signs elsewhere. Treatment by persistent antiseptic inhalation was advised, but it was imperfectly carried out. He objected to the inhaler at night, and, though he used it all day for twelve days, soon lessened the period of use to six hours, and finally to three hours. At his second visit on September 27th he felt better, and the physical signs showed some improvement, but he had lost another ½ lb., his weight now being only 11 st. 6 lb. He was strongly urged to wear the inhaler persistently, day and night, and was warned of the danger of septic infection of his pulmonary cavities. He acted on this advice to the extent of about eight hours daily, that is, for only about one-third of the time advised. Yet even with this imperfect use of the method he began at once to improve, and gained

weight steadily. From 11 st. 6 lb. on September 27th, 1910, it rose persistently to 12 st. 6 lb. on March 8th, 1911. Thus, under treatment by antiseptic inhalation imperfectly carried out, he gained 14 lb. in five and a half months—a larger amount than his previous gain in eight and a half months in a sanatorium. The physical signs also steadily improved, and his evening temperature was normal. Encouraged by this improvement, he reduced the period of inhalation to only six hours daily. In July he caught "fresh colds," and the intense heat of this summer tried him much, the temperature in his outdoor shelter on one occasion rising to 100° F. He lost weight rapidly, and when I saw him again on September 21st his weight was only 11 st. 7 lb., and there was evidence of extension of the disease in his lungs. He was advised to go to bed for a fortnight and to practise continuous inhalation (day and night). He did as advised, and when last seen, on November 22nd, 1911, looked and felt much better, and had gained 4 lb. in weight. His physical signs had also again improved quite definitely.

In this case also the treatment has been imperfectly carried out, yet the benefit derived from it has been unmistakable.

CASE 53.—A patient of Dr. Bousfield of Hornsey Lane, a clerk in an insurance office, recommended by Mr. A. (Case 25 of my first paper), who under treatment by continuous antiseptic inhalation for five months in 1909 made a complete recovery (including the obliteration of a cavity), and who has since done his full work for two years.

The patient was brought by Dr. Bousfield on September 24th, 1910, some tubercle bacilli having been detected in his sputum. The dull areas in his lungs were typical and extensive, but auscultatory evidence was almost absent; there was defective air entry over the dull areas, but no crepitant sound, no prolonged expiration, and no audible whisper over the front of the chest, and only the slightest crepitant sound at one spot in the left lung posteriorly.

Under treatment by continuous antiseptic inhalation this patient made a rapid recovery. Dr. Bousfield brought him to me on October 28th, 1910, and again on December 7th. On each occasion there had been a gain in weight, and the dull areas were smaller than at the previous visit. In the ten weeks he had gained 13 lb. After a stay at the seaside he went back to work at his office, and in October, 1911, I heard that he had been in full work since June, and that he looked extremely well. In November Dr. Bousfield wrote: "The sputum has been tested three times—in June, September, and last week—and *no tubercle bacilli found*. He has gained over a stone and a half in weight, and is better now than he has been for ten years." In reply to an inquiry Dr. Bousfield kindly sent word that the examinations for tubercle bacilli in the sputum were carried out by the Clinical Research Association, Adelphi, with the appended results:

August, 1910. Tubercle bacilli present.

December, 1910. Tubercle bacilli present.

February, 1911. A small number of tubercle bacilli present.

March, 1911. A few tubercle bacilli present.

June, 1911. No tubercle bacilli.

September, 1911. No tubercle bacilli.

November, 1911. No tubercle bacilli.

Dr. Bousfield also confirms the fact of the "progressive disappearance of the areas of dullness."

CASE 54.—A man aged 33, a clerk, sent to me on September 26th, 1910, by the late Dr. Clark of Twickenham. Cough for ten weeks; much yellowish phlegm; no hæmoptysis. Weight, 10 st. 6½ lb.; last spring he weighed 11 st. 7 lb. Large dull areas; poor air-entry; some crepitant sounds at the upper and lower apices of the left lung; catarrhal sounds posteriorly; some prolonged expiration left apex. He was kept in bed for two weeks with persistent antiseptic inhalation. On October 17th he weighed 10 st. 8½ lb. His dull areas were smaller, and the crepitant sounds less marked. On November 14th he weighed 10 st. 10½ lb. Had inhaled for about nineteen hours daily. Still had cough, heartburn, and flatulence, for which a mixture was prescribed. Dull areas still diminishing. On December 7th hæmoptysis occurred and he brought up a large quantity of blood, about 2 pints. There was recurrence of hæmoptysis next day, and again two days later. His weight, which had risen to 10 st. 13 lb. (a gain of 6½ lb.), fell to 10 st 1 lb. No inhalation was employed for three weeks; but as he began to recover from the effects of the hæmoptysis he returned to the practice of continuous inhalation, and he soon began to gain weight rapidly. When I next saw him, on January 9th, 1911, he weighed 10 st. 6 lb. It was found that there had been extension of dullness in the right lung. He was inhaling about seventeen hours daily. From this time there was progressive improvement in his condition and in his physical signs, and the weight increased steadily. On June 7th, 1911, he weighed 11 st. 11½ lb., a total gain of 19 lb. The very hot summer tried him much, but when I saw him on September 25th (almost exactly a year since his first visit) he looked remarkably well and felt well. He then weighed 11 st. 8 lb. He was able to do his work.

CASE 55.—A schoolmaster, aged 52, sent to me on October 1st, 1910, by Dr. J. J. Edwards of Fulham, suffering from mitral stenosis and from recent pulmonary tuberculosis. At the age of 24 he had rheumatism in his ankles and knees, and was in bed for three weeks; but no subsequent attack. He had had influenza "many times, three times in the last 18 months." He had lost 2 or 3 lb. in weight, his present weight being 8 st. 12½ lb. There was a presystolic murmur and short thrill at the apex of the heart, a loud first sound without any systolic murmur, and no second sound. No epigastric pulsation; no enlargement of liver. No aortic murmur. He had a short cough, and marked dullness in the characteristic positions, with very feeble air-entry, and faint crepitant sounds at both lower apices. No prolonged expiration or audible whisper. He was kept in bed for 10 days, with continuous antiseptic inhalation, and afterwards used the inhaler all night and about 12 hours in the daytime. On October 22nd he had gained 5 lb. in the three weeks, and felt that he was "gaining in every way." Cough "altogether gone"—it began to disappear "as soon as he began to wear the inhaler." The dull areas were all smaller, and the entry of air much more free, but slight crepitant sounds were still present. He did not cough at all during this visit. On November 24th he weighed 9 st. 11 lb., a gain of 12½ lb. in eight weeks. Felt very much better. No return of cough or sputum. Was still inhaling about eight hours daily and at night.

Twelve months later (November 27th, 1911), Dr. Edwards reported that this patient seemed to be very well, was doing his work as usual, and had no cough.

CASE 56.—A lady who had taken the degree of M.D.Lond., and had worked as a medical missionary in India, where (in November, 1909) she suffered from pleurisy, and lost 2 st. in weight. Her sputum was examined by an expert pathologist, but no tubercle bacilli were found. A well-known physician found no physical signs of disease in her lungs, but by X-rays an area of disease at the left apex was detected. She was admitted into a sanatorium, and remained for two months, and gained 8 lb. in weight. But her condition again deteriorated, and she was advised to return to the sanatorium. She was, however, sent to me by Dr. Grove of St. Ives, on October 3rd, 1910. Her weight was then 9 st. 5 lb. She had had practically no cough for some months, and she brought up only a very little mucus. Yet she had large dull areas at the apices and elsewhere, especially at both lower apices, with very feeble air entry, definite crepitant sound at both apices on the left side, and faintly heard whisper. She was kept in bed for two weeks and practised continuous antiseptic inhalation as advised in my first paper. On November 4th, 1910, she had gained 4 lb. in weight; all the dull areas were smaller; the air entry was much improved, and the crepitant sounds had nearly disappeared. In December she had indigestion and loss of appetite, and lost 4 lb. in weight, yet the physical signs in her lungs were still improving. The indigestion gradually disappeared, and on February 4th, 1911, she weighed 9 st. 13 lb. The dull areas were now quite small, and there was no crepitant sound, though the air entry was not yet normal. On March 6th, 1911, she wrote, "I am *very* well, just rejoicing in a new influx of life and energy, all the more welcome after the long months of lassitude and depression. I have no cough, and only once or twice a week a trace of mucoid expectoration." She was still inhaling about four hours daily and at night.

On November 17th, 1911, she wrote that she had had no chest symptoms of any kind since her last visit, and had lived an active life, though there was some dyspepsia, and her weight was less than when I last saw her.

She had employed the method of continuous antiseptic inhalation in the case of a patient under her care, with regard to whom a medical man had given a very gloomy prognosis, and who was thought to be "going downhill fast." This patient used the method of antiseptic inhalation for two months, and improved greatly. She then went to live on Dartmoor. She was seen again six months later, and appeared to be very well.

CASE 57.—A man, aged 23, a friend of Case 23, and a patient of Dr. K. C. Mackenzie of Caerphilly, South Wales. His illness began with hæmoptysis in March, 1910. In April he was sent to a sanatorium, and remained in it for three months; during his stay his weight rose from 9 st. 7 lb. to 10 st. 7 lb. In October a second hæmoptysis occurred, with slight pain in the right lung. I saw him first on November 10th, 1910; he then weighed 10 st. 2 lb. The dull areas in his lungs were rather large, especially at the lower apices; air entry very defective; some prolonged expiration, crepitant sound, and audible whisper at the right upper apex, and crepitant sounds at the right lower apex. Teeth carious; nasal passages compressed and obstructed. He was advised to use continuous antiseptic inhalation, to give up smoking, and to spray the nose with a cocaine-eucalyptus-parolein spray. On

December 15th, 1910, having carried out these instructions, he stated that he had no cough and that his rectal temperature was only 98.4°. He had gained 9 lb. in weight (10 st. 11 lb.) in the five weeks; all the dull areas were markedly smaller, and the only auscultatory signs were harsh inspiration and slight crepitus at the right upper apex, with slight crepitus also at the lower apex. In January, 1911, he had an attack of vomiting and diarrhœa lasting three days—apparently a food poisoning, as his father had similar symptoms. It was therefore not surprising that on February 2nd, 1911, he had lost 2 lb. in weight; yet in spite of this his physical signs, both by percussion and by auscultation, were better than at the last visit. He was now inhaling about six hours daily and at night. On May 10th, 1911, though in lighter clothes, he weighed 10 st. 9½ lb.; the dull areas were smaller than in February, and the only auscultatory sign was slight bronchial breathing, without any crepitant sound or bronchophony, in the second right interspace. The sputum had been examined about a month previously. The report stated that there were “still some bacilli, but much fewer than before.”

This patient lives at Cardiff and I have not seen him again, but I regret to hear that in June he had repeated hæmoptysis, and that his present condition is causing anxiety to his friends.

CASE 58.—A young man of 19, brought by Dr. Ashton of Battersea, December 29th, 1910, on account of a cough which had lasted for three months, and occasional night sweats. Weight, 8 st. 1½ lb. He had a loose cough, with typical dull areas of moderate size, some prolonged expiration, with slight bronchophony and audible whisper at the right upper apex, and some crepitant sounds (still audible after a cough) at both upper apices. He was kept in bed for two weeks and practised continuous antiseptic inhalation. On January 27th, 1911, his weight was 8 st. 3 lb., his cough was “much better,” and sputum scanty. The dull areas were all smaller, the prolonged expiration and bronchophony had vanished, and only slight crepitant sounds remained. He was now permitted to take an hour’s walk each morning, but instead of limiting himself to one hour’s exercise, he walked for four hours daily! The consequence was a distinct relapse, the temperature rose to 100°, and on February 24th he was found to have lost 1 lb.; all his dull areas were larger, and some interrupted respiration could be heard at his left apex. He was sent to bed again for two weeks, and made to inhale without intermission. On March 24th he had regained the lost pound (8 st. 3 lb.), and the physical signs had again improved. After this he used the inhaler every night, but very little during the day. His improvement continued, and in June he resumed his work. I examined him again on September 27th, 1911; he looked and felt very well. His weight was still 8 st. 3 lb. His physical signs were nearly normal.

In January, 1912, he was still quite well.

CASE 59.—A clerk of works, aged 44, sent to me by Dr. Mowll of Surbiton, February 10th, 1911, on account of slight hæmoptysis three weeks ago, repeated a week ago. He had had a slight hacking cough for a few days only. There was some complaint of indigestion, with flatulence and palpitation. He had been costive for some years, and had had piles. His weight was 9 st. 7 lb. His heart was normal. His muscular system was well developed (the result of a six months’ course of physical exercises).

Dull areas were found in his lungs, in the positions characteristic of a tuberculous infection, the largest being that at the right lower apex. At this region a slight crepitant sound, possibly frictional, could be heard, and he complained of slight pain in the region of the right nipple on taking a deep inspiration. The only other auscultatory sign was a feebleness of air entry over the apical regions. Medicine was prescribed for his dyspepsia and constipation; he was confined to bed for a week, and advised to practise continuous antiseptic inhalation.

I saw him a second time on March 17th. His weight was 10 st. 4½ lb.; in the five weeks he had gained 11½ lb. All the dull areas were smaller; no rub or crepitant sound could be heard anywhere. There was no pain on breathing, and the air entry was more free. He had been back at work for two weeks, using the inhaler in his office whenever possible. He continued to improve till June, when in the very hot weather he felt faint and had slight hæmoptysis. He came to me a third time on October 19th, 1911, his weight was then 10 st. 2½ lb.; he had no cough, but the physical signs in his lungs showed a slight increase. He was sent to bed for ten days, and practised continuous antiseptic inhalation once more. On November 23rd, 1911, he was found to have gained 2 lb., and thus regained his normal weight of 10 st. 4½ lb. There was no sputum and practically no cough. His dull areas had diminished in size, and the only auscultatory sign was a defect of air entry over these areas.

CASE 60.—A schoolmistress, aged 29, sent by Dr. Muir of Burdett Road, February 11th, 1911. Indigestion for a year, frequent "colds," and "influenza" three weeks ago. No hæmoptysis. No cough, but "phlegm at back of throat." Dull areas, fairly large, were found in all the positions characteristic of a tuberculous infection; the largest were at the right upper and lower apices. The air entry was extremely defective in these positions, and some crepitant sound could be heard at the right lower apex (but nowhere else). No prolonged expiration. Weight, 7 st. 4½ lb. (last summer it was 7 st. 6 lb.). She was sent to bed for ten days, and practised continuous antiseptic inhalation. A tonic mixture was prescribed; milk and malted milk (as in all these cases) was taken four times daily. On March 4th, 1911, she had gained 4 lb. in three weeks, felt and looked much better. The dull areas were all smaller, the air entry was distinctly improved though still defective, and the crepitant sounds had nearly disappeared. On April 1st she had gained 2 lb. more (7 st. 10½ lb.), and further improvement in the physical signs was recorded. She was now permitted to return to her work as a school teacher. On June 3rd she weighed rather less (7 st. 8 lb.), but she felt quite well and had done her full work for two months. The physical signs were now extremely slight. On September 30th, 1911, she appeared to be quite well and had done her full work. She still practised inhalation at night.

CASE 61.—A district nurse, aged 27, a patient of Dr. Adair of Belfast. "Pneumonia" two years ago. At work in England eighteen months. Frequent "colds"; pleurisy two weeks before I first saw her on February 19th, 1911. Weight 8 st. 9 lb. (had been 9 st. last Christmas). Typical dull areas, of which the largest were at her right apex; very defective air entry; catarrhal double crepitus at both upper and at the right lower apices; whisper faintly audible, but no prolonged

expiration. She looked ill and had a frequent short cough. She obtained leave of absence for three months, went back to her home in Belfast, stayed in bed for three weeks, and practised continuous antiseptic inhalation for a month, after which she gradually lessened the time of inhalation. The cough ceased after about two months. She came to me a second time on June 8th, 1911. She looked and felt better; all her dull areas were much smaller, the air entry was good everywhere, and no crepitant sound was audible. Only at the right apex posteriorly there was slight prolongation of expiration and slight bronchophony. She was permitted to return to her work as a district nurse. I saw her for the third time on October 13th, 1911. During all this hot and most trying summer she had worked very hard, and during some weeks had actually done double duty. Her weight was now 8 st. 12½ lb. (a gain of 3½ lb.). She felt perfectly well. No morbid sounds could be detected in her lungs, and all the dull areas were now very small. She was still inhaling for two hours daily and at night.

CASE 62.—A young man, aged 19, seen with Dr. Schaub of Harlesden, February 20th, 1911. He had been well until quite recently, but had suffered from "a cold" for two or three weeks. Dr. Schaub examined his sputum four days ago, and found "*tubercle bacilli in good number*," and a second specimen two days ago was "*crowded with tubercle bacilli*." The patient looked depressed, and had a slight frequent short cough. Weight, 11 st. 2½ lb. Typical dull areas in his lungs, the largest being at the right upper and lower apices. Poor air entry and some crepitant sound at all four apices, whisper faintly audible at the right apex; no prolonged expiration. He was advised to remain in bed for ten days, and to practise continuous antiseptic inhalation.

I saw him a second time on March 13th, 1911; the weight was then 11 st. 7½ lb., a gain of 5 lb. in the three weeks. He felt "quite well," and wished to be allowed to play football! The cough was much lessened in three days after beginning the inhalation. There was now cough only in the early morning, and very little sputum. Dr. Schaub examined this for the third time three days ago, and had "difficulty in finding bacilli." The dull areas were all smaller, the air entry more free though not yet normal, and the crepitant sounds were much diminished. He was advised to continue the persistent inhalation, allowing an interval of two hours every morning. A month later (April 11th, 1911), Dr. Schaub reported that there had been no sputum for a week, and his evening temperature was normal. The dull areas were less than at the last visit; no crepitant sound could be heard; there was a little prolongation of the expiration at the right apex only.

On May 16th, 1911, he stated that he had continued the inhalation six hours daily and at night, and that he had had no cough and no sputum for a month. He looked remarkably well, and had gained 2 lb. in weight (11 st. 9½ lb.), a total gain of 7 lb. The dull areas were now all very small, and no morbid sounds were audible.

On December 3rd, 1911, Dr. Schaub reported that this patient had gone on well, that he had been at work for a month, and that he was keeping up his weight. He still wore the inhaler at night.

On January 16th, 1912, he was still quite well, and had no cough. He had been in full work regularly for three months.

CASE 63.—A girl, aged 13, seen with Dr. Hickley of South Lambeth Road, February 21st, 1911. Out of health two months, abdominal discomfort, cough, and some pyrexia (100° F.) for a few days. She was a pale, thin girl, with a pulse-rate of 140 and respiration-rate of 36. The abdomen was swollen and rather tender; obvious ascites was present, but no lumps or bands could be felt. The lungs showed dull areas in the positions characteristic of tuberculous disease, the largest of them situated at the right upper and lower apices. There was defective air entry, and some slight crepitant sound.

In view of the general condition and of the implication of both thorax and abdomen, a very unfavourable prognosis was given. She was kept at rest in bed, and fed on milk with malted milk every three hours. The windows were kept open, and she wore constantly a Yeo's inhaler, using the antiseptic solution described in my first paper.

Three weeks later Dr. Hickley reported that the child liked her inhaler so much that "she will not be parted from it"; that her cough was better, and the circumference of the abdomen a little less. He detected a lump in the lumbar region. There had been some diarrhoea, relieved by medicine.

I saw her a second time with Dr. Hickley on April 11th, 1911. There had been no cough for a long time, and the temperature was now always normal or subnormal. All the dull areas in the lungs were much smaller. The circumference of the abdomen was 1½ in. less than in February, and no ascitic fluid could be detected. There was a resistant region in the abdomen to the left of the umbilicus, and some enlarged glands in the right iliac fossa. The child was very thin; she had refused to take the milk and malted milk. She promised to do better in this respect, and the parents were advised to insist on her taking this nourishment regularly. The promise was carried out, and Dr. Hickley informs me that she improved very much. Three months later she was so much better that she was able to go to stay with friends in Wales. When she left London in July Dr. Hickley could find no evidence of disease in her lungs, and the abdominal lump was much smaller. But a relapse must have occurred before long, for she died in September. Possibly this relapse may have been due to exhaustion caused by the great heat of last summer, which has caused other tuberculous cases under observation to deteriorate. Thus the gloomy prognosis given at first was justified; yet the temporary improvement while under treatment by continuous antiseptic inhalation was most striking.

CASE 64.—A schoolmistress, aged 45, brought by Dr. Chesters of Bromley, February 22nd, 1911. Cough for about a month; no hæmoptysis; slight indigestion; sleep disturbed by cough. Temperature 99° to 100°; pulse 96; weight 8 st. 12 lb. Dull areas in both lungs, in the positions characteristic of pulmonary tuberculosis, the largest being at the right upper and lower apices. There was deficient air entry, a little prolongation of expiration, and slight bronchophony at the right upper apex, and slight crepitant sounds at both lower apices. She was advised to remain in bed for ten days, and to practise continuous antiseptic inhalation.

On March 12th Dr. Chesters telephoned: "She is doing splendidly." Three days later he brought her to me again. Her weight was then 9 st. 4 lb., a gain of 6 lb. in three weeks. She had not coughed since the second day of her use of the inhaler. Now no sputum. Temperature normal

for the last week. All the dull areas were distinctly smaller, the air entry was more free, and the crepitant sounds had almost entirely disappeared.

I saw her a third time on April 11th, 1911. The temperature had been normal since the last visit. There was no cough and no sputum. The weight was still 9 st. 4 lb. The dull areas were smaller than in March, and the auscultatory signs were nearly normal. In December, 1911, Dr. Chesters reported that she was in excellent health, in spite of the trying summer and of extra work and some anxieties. Her weight had risen to 9 st. 7 lb.

CASE 65.—A clerk, aged 22, sent by Dr. Edwards of Fulham, March 2nd, 1911. Pain on breathing from time to time for several years. Occasional cough, with some phlegm; no hæmoptysis; slight dyspepsia. Dr. Edwards had examined the sputum, but found no bacilli. The patient was anaemic. His weight was 9 st. 9½ lb.; eight months ago it was 9 st. 11 lb. Dull areas were found in all the positions characteristic of pulmonary tuberculosis, the largest being at the left upper and lower apices. There was much defect of air entry, and a little crepitant sound at both upper apices in front. Posteriorly, at the left upper apex the inspiration was somewhat harsh, and the expiration was slightly prolonged; at the three other apices hardly any entry of air could be heard. He was kept in bed for ten days, and practised continuous antiseptic inhalation. He was forbidden to smoke. An alkaline tonic mixture was given before meals.

On March 23rd, 1911, his weight was 9 st. 12½ lb., a gain of 3 lb. in three weeks; he felt and looked better, his cough had disappeared, dyspepsia much less, dull areas smaller, and air entry much more free. Still slight crepitant sound at both upper apices. On April 20th, 1911, he felt "very well indeed," and his weight was 9 st. 13 lb. Iron was prescribed for his anaemia, and he was permitted to go back to work. On May 30th, 1911, he was still very well, though he had worked in a lawyer's office for four hours daily. He had continued the inhalation six hours daily, and at night. On September 18th, 1911, he had worked from 10 a.m. to 3 p.m. regularly since July, except during a three weeks' holiday. In spite of the trying heat he had remained very well. The dull areas were now small, the entry of air satisfactory, and morbid sounds on auscultation almost absent. He was advised to use his inhaler at night for a further period of six months.

CASE 66.—A boy of 17, seen at his home in Battersea with Dr. Ashton, March 12th, 1911. Very bad cough since November, and some cough since October. No hæmoptysis. Some sputum. Has grown thinner lately. Evening temperature 99.5° F. Dull areas were found at all four apices; the air entry was defective, and some crepitant sound could be heard above the right nipple. He remained in bed and practised continuous antiseptic inhalation. Six weeks later he was brought to my house by Dr. Ashton, who reported that "the temperature continued at 99.5° F. to 100° F. every evening until two days ago; last evening only 99° F.; in the morning usually 98° F." The patient said that his cough was "ever so much better." His weight was now 9 st. 3½ lb.; before Christmas it was 8 st. 7 lb., and Dr. Ashton stated that he had lost flesh considerably before I saw him in March, so that he appeared to have gained fully a stone in weight during the six weeks of treatment.

The dull areas were all smaller. There was now some prolonged expiratory sound at the right upper apex, both in front and behind, but hardly any crepitant sounds. On June 15th, 1911, I saw him again at his own home with Dr. Ashton. He was still inhaling for eight hours daily and at night. There was now practically no cough, and the temperature had not been above the normal for a long time. He looked plump and well. His weight was now 9 st. 5½ lb. The dull areas at his apices were distinctly smaller; no crepitant sounds could be heard, but there was still a little prolonged expiration at the right apex.

In January, 1912, Dr. Ashton informed me that this patient was still doing well.

CASE 67.—A lady, aged 26, brought by Dr. Hickleby of South Lambeth Road, March 14th, 1911. Had suffered from more or less indigestion for five years, but had coughed only for about a fortnight. The cough kept her awake at night, and there had been some night sweats. Her weight was 9 st. 11½ lb.; in August, 1910, it had been 10 st. 2 lb. The dull areas characteristic of pulmonary tuberculosis were found in her lungs, with defective air entry, and some prolongation of expiration, with very slight crepitant sound, in the right suprascapular fossa only. She was kept in bed for a week, and practised continuous antiseptic inhalation for seven weeks. On May 2nd, 1911, I saw her a second time, when she felt "very much better." The cough "lingered on for a week or two," but there had been no cough for the last three weeks. The appetite was "very good," and she slept well. Her weight had increased by 11½ lb. in seven weeks, and was now 10 st. 9 lb. She looked very well. All the dull areas were smaller, the air entry was more free, and hardly any morbid sound could be detected.

She was instructed to use breathing exercises twice daily, and advised to inhale at night and for six hours daily. On May 31st, 1911, she felt "very well indeed," except for slight indigestion. On July 28th, 1911, her weight was found to be 10 st. 10½ lb.—a total gain of 13 lb. There was no cough at all: no morbid sounds could be heard in her lungs, and the dull areas were all quite small. She was considered to be cured, but was advised to continue the inhalations for four hours daily for a further period.

CASE 68.—A lady, aged 22, seen with Dr. Ehrmann of Camden Road, April 3rd, 1911. Well until ten days ago, when she was overtired by a dance lasting till 5 a.m.; two days later there was slight sore throat; three days later her temperature was found to be 100° F.; it was now 101° in the morning and 102° in the evening. Slight cough, but no sputum. On examination of her chest it was found that she had small areas of dullness in all the positions characteristic of an early pulmonary tuberculosis, the largest being at the right upper and lower apices. Auscultatory signs were almost absent. She was directed to remain in bed for a week, and to practise continuous antiseptic inhalation for three weeks. On April 24th, 1911, Dr. Ehrmann brought her to my house; her weight was then 10 st. 8 lb. She had inhaled as directed; the temperature fell to normal in three days, and had not again been above the normal. The cough had gradually lessened; it disappeared three days ago. No sputum. She felt quite well. The dull areas were distinctly smaller; there was good air entry in front, with very slight crepitant sound at the end of inspiration. There was a defective air

entry at the right upper apex behind, and very slight crepitant sound at the end of inspiration at the right lower apex ; nothing else abnormal. She was advised to continue the persistent inhalation for three weeks longer, except for two hours in the morning and an hour in the afternoon. On May 17th, 1911, her weight was 10 st. 10½ lb., a gain of 2½ lb. She felt quite well. The dull areas were now very small, and the only abnormalities detected by auscultation were slight defect of air entry and the slightest possible crepitus. She was considered to be cured, and advised to practise breathing exercises and still to use her inhaler for three hours daily.

In January, 1912, Dr. Ehrmann kindly informed me that this lady was still quite well and fully able to perform all her usual occupations.

CASE 69.—A lady, aged 39, sent by Dr. Edwards of Fulham, May 31st, 1911. Cough in winter time for some years ; very subject to "colds going on to bronchitis." For about three years has had asthmatic attacks, which recur about once a month. Since March, 1911, she has had continual cough, with shortness of breath and yellow phlegm, and has lost weight. Anorexia, dyspepsia, flatulence, and disturbed sleep.

Weight 6 st. 9½ lb. On examination of her chest the signs found were not those of a generalized bronchitis : they were limited to the regions affected in early pulmonary tuberculosis. There were rather large areas of dullness at the characteristic positions at the four apices and elsewhere ; the air entry at the apices was very defective, and prolonged expiration, bronchophony, and audible whisper were heard at both upper and lower apices on the right side posteriorly. She was kept in bed for two weeks, and practised continuous antiseptic inhalation, and a tonic was prescribed.

On June 28th she had gained a pound in weight, and her condition was slightly improved, but she still suffered from asthma, which disturbed her sleep. A nasal spray of cocaine, eucalyptus, and parolein was therefore prescribed, to be used three times a day, and the continuous antiseptic inhalation was continued. On July 25th she stated that she had been quite free from asthma since she had used the nasal spray ; the physical signs in her lungs were decidedly improved. On September 23rd, 1911, she felt and looked better, in spite of the very trying summer ; the dull areas were still smaller and the air entry much improved, but there was now distinct evidence of a small (dry) cavity at the right apex posteriorly. She was advised to persevere with the inhalations, and to practise breathing exercises.

On January 9th, 1912, she weighed 6 st. 13½ lb., a gain of four pounds. She was still quite free from asthma and had no cough, though on some mornings she brought up a small quantity of phlegm on waking. She was still using the inhaler at night and for four hours in the daytime. Her dull areas were now very much smaller, and the only morbid sound detected was a slightly prolonged expiration at the right apex posteriorly. She was dismissed as cured, but advised to use the inhaler two to three hours daily for the next six months.

CASE 70.—The matron of a convalescent home (formerly a hospital sister) came to me on August 5th, 1911, on account of a general feeling of illness, and occasional night sweats, with loss of weight (5½ lb. during the last month). She had, however, no cough at all, and no

pain in the chest. On examination the only sign of disease that could be discovered was the existence of small dull areas in both lungs, in the positions characteristic of an incipient pulmonary tuberculosis, and very slight catarrhal sound at both apices in front. The signs might easily have been overlooked altogether.

She was unable to begin a course of treatment until a week later, when arrangements had been made to release her from duty. During this week there was a further loss of weight to the amount of 2 lb. But during the first week of treatment (in bed) by continuous antiseptic inhalation she regained these 2 lb. and in the following week gained $2\frac{1}{2}$ lb. more. On August 24th, 1911, she wrote: "Already life is so much more worth living, and that excessively tired feeling has almost vanished. I can hardly believe that it is only three weeks since I felt such an absolute wreck." On September 1st, 1911, she wrote: "I gained another $2\frac{1}{4}$ lb. this week—that makes $4\frac{3}{4}$ lb. My temperature is much more steady; at first it was generally 96.4° in the morning and 99° at night. Now it is 97.4° - 98° in the morning and 98° - 98.2° at night. Also I don't have the night sweats now."

On September 16th, 1911, all her dull areas were found to be smaller, and the catarrhal sounds at the apices had nearly disappeared. There were some digestive difficulties in October, but when these were overcome she again gained weight. Up to the end of this month she had been using the inhaler persistently, except during an hour's exercise each morning. She now reduced the time of inhalation to eight hours in the daytime, and at night; with a further reduction of one hour every fortnight. On December 9th she wrote: "I am still feeling quite well, my weight is quite steady, and I feel equal to anything. I can't understand anybody having a doubt as to the efficacy of the treatment. I wish I could satisfactorily explain how different in every way I feel, and have felt since shortly after taking up the treatment."

On December 29th, 1911, the dull areas were found to be still further lessened, and the air entry was good. Only the faintest crepitant sound (probably pleural) was detected at one apex.

On February 1st, 1912, she was found to be quite well, and no morbid sounds could be detected. She has since resumed her duties.

APPENDIX IV.

THE CONQUEST OF TUBERCULOSIS.¹

THE annihilation of tuberculosis is the most urgent and the most important problem of medicine in these early years of the twentieth century. The returns of the Registrar-General show that at present 40,000 deaths are caused every year in England and Wales by pulmonary tuberculosis, and 16,000 more by other forms of tuberculosis. Ireland has a tubercle mortality of more than 10,000, Scotland of nearly 10,000, making a total of 75,000 deaths in the United Kingdom. France, Germany and other countries are similarly affected. In India, as I am informed by my former house-physician, Major Leonard Rogers, F.R.C.P., F.R.C.S., Professor of Pathology in Calcutta, tuberculosis is much more common than has been generally believed. I learn from my former clinical clerk, Dr. G. L. Tuck, now Assistant Director of the Imperial Army Medical College at Tientsin, that (so far as the figures are available) tuberculosis is the chief cause of fatal disease in China. Dr. Bulloch, in his masterly Dobell Lecture,² has told us that in Japan tuberculosis is as common as in Great Britain. The problem is world-wide, and a successful solution would bring about results of benefit to humanity similar to, and surpassing, the results which medical science has already attained by the conquest of malaria and of yellow fever, results more important than may be expected from the new medication proposed for the eradication of syphilis.

As far as the human type of tuberculosis is concerned—and

¹ Reprinted from *The British Journal of Tuberculosis*.

² Delivered before the Royal College of Physicians of London, November 10, 1910.

this has now been proved to be the cause of an overwhelming majority of all the cases of tuberculosis—it is evident that the key to the solution is found in its predominant localisation in the lungs. If the bacillus can be successfully attacked in this region, and its development and multiplication arrested, its diffusion by means of sputum would be effectually controlled, and the infection of the intestine and of other organs would be almost entirely abolished. Sanitary and hygienic measures are of value, but they are in themselves quite inadequate. The conditions essential to success lie deeper. What is required is the recognition of the pulmonary affection in its very earliest stage in every individual case of the disease, and the prompt, thorough, and persevering treatment of this initial pulmonary tuberculosis.

These two conditions are by no means satisfied by present medical practice. What is immediately and urgently necessary is that every practitioner of medicine should learn how to recognise the pulmonary disease at its very commencement, and how to treat it effectually, without waiting for the appearance of bacilli in the sputum. It cannot be too clearly understood that while the detection of tubercle bacilli is useful as confirmatory evidence, the fact that no bacilli can be detected in the sputum is of no value whatever, and a reliance on such negative results has caused disaster to thousands of patients. Long before bacilli appear in the sputum (as a general rule) characteristic physical signs can be detected in the lungs, and it is the practitioner's duty to discover them. The discovery has been made possible by Sir James Kingston Fowler's careful description of the exact situations in the lungs where the tuberculous process almost invariably begins, and of the direction of spread from each of these early foci. These observations were made in the post-mortem room nearly twenty years ago, and their truth as expressions of pathological fact is recognised in the text-books, but their value for clinical medicine has never been adequately appreciated. The facts described by Sir James Kingston Fowler can all be verified clinically by careful percussion. Unfortunately, the text-book descriptions of the earliest physical signs lay stress on auscultation chiefly, and give their readers the most vague and inadequate information with regard to percussion in early pulmonary tuberculosis. In a paper read before the Therapeutical Section of the Royal Society of Medicine, November 2, 1909, I described the exact situations with regard to the thoracic wall where the earliest physical signs are to be

detected by careful percussion. Over the areas of dullness thus discovered there may be little auscultatory evidence—merely defect of air-entry or the slightest catarrhal sound. The condition is a local microbic infection, producing lack of function. It is exactly similar to the condition during the first twenty-four hours of a pneumococcal invasion of the lungs, in which careful examination reveals a localised area of relative dullness, with deficiency or absence of inspiratory sound. But whereas in pneumonia the rapid multiplication of the pneumococcus quickly changes the physical signs, the much slower development of the tubercle bacillus allows the recognition of the signs above described for weeks or months.

An incipient pulmonary tuberculosis having thus been demonstrated, how is it to be attacked? Rest, warmth, abundance of fresh air and abundance of nourishment, with medical treatment of digestive difficulties, are most useful, and at this stage of the disease may be very successful. They help the patient in his fight with the bacilli, and by their aid he may be victorious. Yet is it not possible and desirable to do something more, to add to these useful measures some well-planned and effective attack on the bacilli themselves? Thirty years ago it was shown by Sir William Roberts, Dr. Coghill, and Dr. Burney Yeo, that inhalation of various antiseptic substances appeared to produce very decided amelioration in cases of phthisis. But the inhalations were administered like doses of medicine—so many times a day, and for short periods. Obviously, if such inhalations are to attain their maximum effect, they ought to be continuous except at meal-times. By-and-by the voice of therapeutic scepticism inquired how anyone could expect to influence a tuberculous process deep in the lungs by such means, and the objection was reinforced by a calculation of the amount of antiseptic actually absorbed from a Yeo's inhaler. The conclusion was drawn that all such inhalations were useless. Yet that excellent clinician Dr. Wilson Fox replied: "The antiseptic effect has been doubted by Hassall, *but there can be no question* that inhalations practised in this manner, with creosote, thymol, eucalyptus, iodoform, iodine, or terebene, tend to diminish cough and expectoration, and that in some cases marked improvement in the patient's state occurs during their use, even in very advanced stages." To this the bacteriologist replies that it is difficult to see how any antiseptic can be administered in quantity sufficient to arrest the growth of

tubercle bacilli in the lungs without injury to the patient. The answer to this difficulty must be "*Solvitur ambulando.*" As a matter of clinical experience, it is found that, under the use of continuous antiseptic inhalation, cough and sputum are quickly diminished, the temperature soon falls to normal, there is a rapid gain in weight, the dull areas lessen, and tubercle bacilli are less easily found by the microscope, and they gradually disappear altogether. For the proof of these statements I must refer to the details of thirty incipient or early cases given in my paper already referred to, and of twenty additional cases, some of them advanced or complicated cases, narrated in a subsequent paper. From the facts described with regard to these fifty cases, it seems to be sufficiently proved that the method of treatment by continuous antiseptic inhalation has certainly the power of inhibiting the development of the tubercle bacillus, and of bringing to an end the morbid process caused by it. And not only the tubercle bacillus, but that most fatal complication, a streptococcal infection of a tuberculous lung, can be dealt with successfully by this method, as proved by Case 3. And even where an acute process has caused the formation of several cavities, as in Case 23, a favourable result may be obtained. Both these patients are completely cured, and have been for a considerable period in full and active work.

In the employment of this treatment it is not necessary to keep the patient in bed for a long time or in a condition of enforced idleness. A week or ten days in bed is usually enough for an incipient or early case, and reading, sewing, knitting, and some games, such as chess or draughts, may be permitted. Even in more advanced cases two or three weeks in bed are often sufficient. If a longer stay is required, gentle massage should be employed. It is usually unnecessary to send the patient away from home to some special institution or to some special climate: if he has an airy bedroom and keeps his windows open, the treatment can be carried out successfully in his own house. This fact, with the absence of enforced idleness and the much smaller expense, is a very great gain. Even in very advanced cases, in which it is hopeless to expect a cure, the adoption of the inhalation treatment often gives much relief, helps to limit the spread of infection, and enables the patient to do light work for himself or others for a much longer time.

If this method of treatment were adopted for every case of pulmonary tuberculosis, and if at the same time every member

of the medical profession learned to detect the earliest stage of the disease, and abandoned reliance on a negative bacteriological report, within a very few years such a conquest over tuberculosis would be achieved as seems to us now a hopeless dream.

THE TREATMENT OF PULMONARY TUBERCULOSIS

[An Address delivered (by request) before the Cambridge
Medical Society, May 2, 1913.]

THE proper treatment for pulmonary tuberculosis is the most important and the most urgent problem for the medical profession at the present time. It is the most important, because nearly fifty thousand persons die every year in the United Kingdom from this disease. It is the most urgent, because a new national organisation is now being evolved, and special medical officers appointed everywhere, in order to ensure combined and intelligent action.

No time could be more appropriate for a careful and dispassionate discussion of the question how best to direct the efforts of this new organisation with regard to the treatment of pulmonary tuberculosis; and I therefore respond with pleasure to the invitation which you, Sir, the President of this Society, have been good enough to give me to state the case from the point of view which I advocated in my Bradshaw Lecture before the Royal College of Physicians in November last, in which I described my personal experience of the treatment of this disease during the last eight years.

No one can question the fact that the treatment by abundance of fresh air, abundance of nutriment, absolute rest while pyrexia is present, and carefully regulated exercise when it has disappeared, has produced excellent results in many cases, and that many patients are indebted

for their lives and restored health to the careful treatment which they have received in a sanatorium.

Yet it must also be acknowledged that this is an expensive method of treatment, and that the expense excludes the great majority of cases for whom effective treatment is urgently necessary. It must also be acknowledged that the benefit conferred even by a prolonged residence in a sanatorium is often insufficient for complete recovery, and that many cases relapse when they return to ordinary life, so that in the mind of the profession there is a growing scepticism as to the curative value of the sanatorium. And indeed it is obvious enough that while sanatorium-treatment, as ordinarily conducted, places the patient under the most favourable circumstances for fighting his battle with the invading bacilli, it gives him no assistance in the fight otherwise than by an endeavour to strengthen his power of resistance. It does not include any active attack on the bacilli themselves.

It is the consciousness of this defect which has made those who are responsible for the treatment of pulmonary tuberculosis willing to lend an ear to those who in recent years, with much confident assertion that this is the only effective method, have advocated treatment by injection of tuberculin. Among these advocates there are some cautious spirits who begin the treatment with minute doses and carefully observe the effect produced on the patient, gradually increasing the dose as may seem to be indicated, but careful always to avoid (if possible) any unfavourable effect. But there are other advocates of tuberculin who laugh to scorn these cautious and careful measures, and who rapidly increase the amount of tuberculin injected until a very large dose is employed, making light of any unpleasant effects of which the patient complains.

Now it must be granted at once that clinical medicine is often too timid in the employment of its remedies, and that striking therapeutic results may sometimes

be obtained by the use of doses much larger than those ordinarily employed. But the use of such doses (for example of sodium salicylate in acute and subacute rheumatism) demands watchful care, and the painstaking employment of such methods, and the conscientious observance of such precautions, as experience has shown to be necessary. *With* these precautions and *by* these methods brilliant results may be secured without injury to the patient.

Is this the case with regard to large and increasing doses of tuberculin?

I have endeavoured to keep an open mind on this subject, for any new form of treatment ought to be judged on its merits, and we cannot afford to disregard any method which can produce satisfactory evidence of beneficial result, provided that it does not prove dangerous in other ways. I have, therefore, for some time past, endeavoured by personal inquiry from medical men whom I have met—physicians, surgeons and general practitioners—to ascertain what they have individually observed of the therapeutic and toxic effects of tuberculin.

The most definite expression of opinion as to a real therapeutic effect was given by a physician connected with one of the Chest Hospitals, who thought that in cases of pulmonary tuberculosis which had reached an apparently stationary condition a distinct improvement was sometimes brought about by the employment of tuberculin. The great majority of my informants were unable to say that they had seen any marked benefit in cases in which tuberculin had been administered, and not even one of them was convinced that he had seen a case of pulmonary tuberculosis definitely cured by tuberculin injections.

This evidence, so far as it goes, seems to be in accord with the conclusions quoted in the *Lancet* of April 12, 1913, from a lecture by Mr. W. Palin Elderton, Fellow of the Institute of Actuaries, at the Galton Laboratory,

University College. "There was no evidence," Mr. Elderton considered, "to prove that tuberculin as compared with ordinary sanatorium-treatment appreciably lengthened the life of the consumptive. If the use of tuberculin had the very marked results claimed by some of its supporters, more definite evidence of its effect on mortality would have been anticipated."

On the other hand, it is claimed by Dr. Bardswell, the Medical Superintendent of King Edward the Seventh Sanatorium at Midhurst, that in a series of cases treated with tuberculin the bacilli disappeared from the sputum at an earlier period than in the cases not so treated. This, if confirmed by the experience of other observers, seems to be distinct evidence of the reality of some therapeutic effect.

Much more than this is claimed by some of the more strenuous supporters of tuberculin. But in estimating the reality of a curative effect in pulmonary tuberculosis it is necessary to remember that the assertion of a patient that he is "better" is worthless, unless it is confirmed by the disappearance or marked diminution of pyrexia, of cough, and of expectoration, by definite gain of weight, and by clear evidence of improvement of the physical signs.

If a real therapeutic effect of tuberculin in pulmonary tuberculosis can be demonstrated, another question still remains for consideration. Can it be given without danger? We all remember what happened when Koch first introduced the method. Can it be proved that more modern methods are free from risk? Is there no danger in stimulating to fresh activity quiescent tuberculous foci in the lungs and glands? Any one who has watched the effect of tuberculin on a patch of lupus must have grave doubts of its harmlessness in tuberculosis of the lungs. Clearly it is necessary that whenever tuberculin is used the most careful physical examination of the lungs by percussion and auscultation ought to be diligently practised, to ensure that focal changes in the

lungs shall be carefully observed and controlled. Clearly, also, if such focal changes occur, the patient ought to be kept at rest in bed.

I have myself seen two cases in which, in my judgment, the fatal issue was due mainly, perhaps wholly, to the administration of tuberculin, and a third case in which it was stated that the injections produced at once an unfavourable effect, and that death was only averted by giving up these injections: the patient finally recovered, but with greatly damaged lungs. I have also heard of four other cases in which, in the opinion of the medical men who told me of them, treatment by tuberculin was mainly responsible for the fatal result.

Tuberculin is a double-edged instrument. In skilled hands, if used with care and accompanied by close supervision and regular physical examination, it appears to be capable of giving some slight assistance in the treatment of pulmonary tuberculosis. But if used carelessly, with insufficient observation of the patient's condition and disregard of physical examination, it may easily do much harm, especially in the hands of a physician who has adopted the view that this is the only method of cure! If the new Tuberculosis Officers are men who enter on their office with the belief that the only form of treatment which gives a chance of recovery is to transfer the patient to a sanatorium and then inject him with tuberculin, the results will certainly be disastrous, and it would have been better for the nation if they had never been appointed.

It is a pleasure to turn from this dangerous and comparatively ineffective method to a form of treatment which produces far better results, and yet which is both cheap and free from risk. It is the treatment by continuous inhalation of volatile antiseptics by means of a simple mask of perforated zinc as invented and described by Dr. Yeo thirty years ago. The first suggestion of the method in England was made by Sir William Roberts, Dr. Coghill and Dr. Yeo, who all published evidence of its usefulness, and this was confirmed by Dr. Wilson Fox.

Unfortunately they did not realise the necessity for insisting that the use of the method should be continuous throughout the whole of the twenty-four hours, except at meal-times. But Professor Ruata of Perugia did order its continuous employment, and he has been rewarded with a series of successful results, of which I was not aware until after the delivery of my Bradshaw Lecture.

Before referring to my own results from this method of treatment it seems desirable to reply at once to the sceptic who "cannot see how it can possibly do any good," for I have heard of the case of a young physician suffering from early pulmonary tuberculosis, who declined even to give a trial to this method, because he did not understand how it could possibly influence the tuberculous process in his lungs. Yet a little reflection might surely have convinced him that if all the in-going air is charged with antiseptic vapour, by the principle of the diffusion of gases the antiseptics must certainly reach the pulmonary alveoli, if the inhaler is worn for a sufficiently long period. And if the antiseptics are dissolved in alcohol, chloroform and ether they must also make their way into the blood, for this is a dilute A.C.E. mixture, and if used in greater strength would prove its absorption by producing anaesthesia. From the purely theoretical side, therefore, there is strong reason for thinking that under this double attack, continued persistently, the local morbid process in the lungs may be gradually overcome.

But the final appeal must be to the results of experience. I have employed this method of treatment in about 100 cases, and have already published the results obtained in seventy of them. Cases 1-30 were reported in the *British Medical Journal*, December 11, 1909; Cases 31-50 in the *Lancet*, November 19, 1910; Cases 51-70 in the *British Medical Journal*, April 6, 1912. The present condition of each of these cases in October, 1912, with very few exceptions, was ascertained by letters

directed to the patient or to the medical man who sent him. The results were stated in my Bradshaw Lecture before the Royal College of Physicians, November 5, 1912. No case which had not been apparently well for at least a year was admitted into this list. The results were :

Complete recoveries - - - -	48
Probably complete recoveries - -	3
	—51
Cases incompletely cured - - -	10
Final result not known - - -	2
Died - - - - -	7
	—
	70

Of the 10 incompletely cured, 9 had improved remarkably, one had deteriorated. Of the 7 deaths, 1 case was hopeless when first seen (she had been treated for six months with tuberculin); 2 abandoned treatment (each of these was an early case when treated, and each improved remarkably while under treatment); 1 died from hæmoptysis, 1 from abdominal tuberculosis, 1 from tuberculous meningitis, and 1 from an apoplectic attack after recovery from the lung disease. Of the 48 complete recoveries, 4 had been quite well and in active work for five years, 8 for four years or more, 11 for three years, 9 for two years, and 15 for one year or more. In the remaining case recovery was followed some months later by an attack of paralysis. The rapid gain in weight is remarkable. In 33 cases it showed an average of 3.8 pounds in the first three weeks, and in 59 cases the total gain in weight an average of 12.4 pounds.

The great majority of these seventy were incipient or early cases. It is, of course, in these that the best results are to be expected, whatever form of treatment be employed. But to show that the usefulness of the method is not limited to slight and early cases, I will quote four cases of active and virulent infection, all of which owed

their recovery, I think, to the continuous antiseptic inhalation.

CASE 3 was a man aged 34, from whom caseous tuberculous glands had been removed from the cervical region five weeks previously. Pyrexia, dyspnoea, mucoid sputum, and some night sweats were present, and dull apical areas. Soon there was evidence of a pleural effusion on the right side; this was aspirated by Dr. Thoresby Jones, and proved to be sterile. A Yeo's inhaler was worn day and night; the patient was carefully nursed and fed on milk and malted milk. The expectoration rapidly increased in amount and became mucopurulent, it was found to be full of streptococci. This fact, indicating a streptococcal infection of a tuberculous lung, seemed to me to render the prognosis almost hopeless. A month after he came under treatment a violent paroxysm of coughing occurred, lasting five or six hours, when he brought up much purulent material and some blood, the temperature rising to 103° and the pulse to 130 for a short time. The inhaler had been worn persistently, and improvement now began to be manifest. Three days later the temperature fell to normal, and it remained normal. The amount of sputum diminished steadily: after ten days it was found that there was no evidence of fluid in the right pleura, but that a basic cavity now existed. After this time the physical signs rapidly improved, recovery was uninterrupted, and he resumed his work. A year and eight months afterwards he was found to have gained more than fifty pounds in weight. He has remained now for nearly six years in excellent health and in full work. What had nearly been a tragedy ended in a romance, for he married the nurse who had tended him so well.

CASE 23 was a man aged 32, whose illness began four months before I saw him; he had lost weight rapidly. There were dull areas at all four apices, with signs of a cavity at his right apex. Temperature 99.8° F. Sputum scanty but containing numerous tubercle bacilli. A week

after his first visit to me he had hæmoptysis twice, and his temperature rose to 103° F. Six days later I saw him at his own house in consultation with Dr. Rudd of Acton. The physical signs were more marked, and it was clear that the disease was making rapid progress. But under persistent antiseptic inhalation he improved more than we had dared to hope; the temperature fell to normal and remained normal. There were signs of cavitation at three other situations in addition to the original cavity at the right apex. He was kept in bed for five weeks, and was then sent to Bournemouth. He resigned his situation, sold his house, and went to the seaside feeling that he had no hope of recovery. But he took his inhaler with him and wore it persistently for four months. Afterwards he received weekly injections of tuberculin from Dr. J. R. Morton of Bournemouth for three months. Whether these injections did or did not help him, I do not know; but none were given until he had been treated by antiseptic inhalation for five months and very great improvement had been effected. In seven months he gained 14 pounds, three of the cavities had disappeared, and only a small cavity at the right apex remained. This also soon disappeared, and he resumed his work, having been re-instated in his former situation. During the following summer, after the day's work was done, he played cricket and golf. During the next-following summer he ran eighty yards in a "relay race," at sprinting pace, and won the race for his side, without showing any distress; also at cricket he bowled for an hour, and afterwards had an innings lasting three hours, in which he made 100 runs and was "not out!"

He has remained in good health and in full work for three years.

CASE 31 was a man nearly seventy years old, and of intemperate habits as regards alcohol, who was seized with sudden dyspnoea which was found to be due to partial pneumothorax on the left side, the heart being somewhat displaced to the right. I saw him in

consultation with Dr. Hickey of South Lambeth Road. There was dullness at all four apices, with crepitant sounds, blowing expiration, bronchophony and audible whisper. Considering the age of the patient, the history of chronic alcoholism, the pneumothorax, and the marked evidence of pulmonary tuberculosis, the prognosis appeared to be almost hopeless. But he was advised to adopt the plan of treatment by continuous antiseptic inhalation, in the hope of securing at all events some alleviation and improvement. Accordingly, he wore a Yeo's inhaler for six weeks, during the first three of which he remained in bed. He then gave up the inhaler and went to the seaside. A fortnight later he returned to his business, and he has been well and in full work for more than two years.

CASE 47 was a young man, aged 21, whom I saw in consultation with my colleague Mr. Warren Low, F.R.C.S., at a nursing home. He had been admitted on account of a tensely swollen tuberculous knee, the opinion having been expressed by a well-known provincial surgeon that amputation was necessary. For eleven months he had suffered from cough and for the last six weeks it had been very distressing. He brought up a copious mucoid expectoration. The temperature since admission had been 101.8° F. to 103° F. His cough was frequent, and whenever he coughed an expression of pain was seen on his face, the inflamed knee being jarred by the effort. He had large dull areas at all four apices, with some crepitant sounds, but no proof of cavitation. Mr. Low had already given him some relief by the use of a Von Bier's elastic bandage, and it was advised that he should be fed with milk and malted milk, and should practise continuous antiseptic inhalation. Mr. Low and I agreed that amputation would probably have been fatal. Under the use of the inhaler the cough was at once relieved, and it almost disappeared within a few days. Three months later Mr. Low kindly gave me an opportunity of examining him again. The knee had greatly improved under Mr. Low's treatment, the patient's general appearance also

showed great improvement. There was no pain and hardly any cough. All his dull areas were much smaller, and the auscultatory signs were localised and much less definite. During the following year he developed spinal caries and a psoas abscess, which required surgical treatment. After recovery from this he had some hæmaturia and passed a small renal calculus. Yet Mr. Low informs me that he has made a complete recovery, except that his knee is stiff. This striking result must be attributed to the careful surgical treatment which the patient received from Mr. Low, and yet I think that the surgeon's skill would have been unavailing, without the cure of the patient's pulmonary tuberculosis by the continuous antiseptic inhalation.

These four cases have been already published. I will add to them one recent case treated since the delivery of my Bradshaw Lecture.

A lady, aged 37, was brought to me, December 2, 1912, by Dr. Bremner of Lower Clapton Road. She had suffered from pulmonary tuberculosis for at least two years and a half. Exactly two years before she came to me she had been sent to a sanatorium, where she remained for five and a half months; during this time severe hæmoptysis occurred. She left the sanatorium on May 15, 1911, but continued to practise sanatorium methods. Five months later (October, 1911), she was placed under the care of one of the most strenuous advocates of tuberculin. She remained under his care for six months, and received an injection of tuberculin twice a week during the whole of that time, at first in small doses, afterwards in doses which were increased up to the full amount of 1 c.c. of old tuberculin. There was always more or less reaction, with a quick pulse. Twice a severe reaction occurred, with a rectal temperature of 101° F. The sputum was examined many times; tubercle bacilli in moderate number were found before she went into the sanatorium, but never since.

At the conclusion of the six months' course of treatment

with tuberculin, she was advised by the physician who had administered the tuberculin, to discontinue the treatment and to go to live at the seaside. During the six months she had not gained weight ; on the contrary, she had lost about two pounds. This loss of weight continued during the following seven months. From April to November, 1912, she lost five pounds more, making a total loss of seven pounds during the thirteen months since the commencement of the tuberculin treatment. When Dr. Bremner brought her to me, December 2, 1912, I requested them both to give me a candid opinion as to the results of the tuberculin treatment. Dr. Bremner, who had observed the case very carefully throughout, told me that, in his judgment, the tuberculin had done no good whatever. The patient herself thought that at the end of the course she could breathe a little more easily and was capable of a little more exertion. But Dr. Bremner reminded her that she had previously been practising strict sanatorium methods, and had abstained from all exertion ; he thought that the slight improvement was entirely due to the increased exercise which had been necessitated by the journeys twice weekly for the sake of treatment.

Here, then, was a patient with advanced pulmonary tuberculosis, who had tested the value both of sanatorium treatment and of tuberculin systematically and very thoroughly administered, yet not only could no definite improvement be recorded but she had actually lost seven pounds during the last thirteen months.

On examining her lungs I found clear evidence of a cavity at the right upper apex posteriorly, with blowing expiration, moist crackle, and audible whisper. There were large dull areas at all four apices and elsewhere, and I found an unusually extensive consolidation in the lower part of the right upper lobe. Over the whole of the right front moist sounds could be heard, and there was some crepitus at both lower apices. Her weight was 8 st. 8½ lb.

It was emphatically a case in which, unless antiseptic inhalation could help her, the prognosis appeared to be hopeless, and a fatal issue certain. The patient willingly consented to remain in bed for a fortnight, and to give a careful and thorough trial to the treatment by continuous antiseptic inhalation.

When she came to me again three weeks later, she had gained 5 pounds in weight, the dull areas were all smaller, and the moist sounds in her lungs were much diminished. After another month I found a further gain of $2\frac{1}{2}$ pounds ; the dull areas were still diminishing, and the cavity was nearly dry. Slight hæmoptysis had occurred. During the third month of treatment, she was attacked by influenza, which was then prevalent. After this she had very violent cough for several days, and expectorated very copious purulent sputum, sometimes tinged with blood. Evidently a tuberculous focus had softened down and been expectorated. Yet in spite of this distressing experience, on her fourth visit she was found to have gained another pound in weight, and her physical signs were still improving. She was now sent to Bournemouth, and during her stay of five weeks sat out much in the open air, but continued to wear her inhaler as much as possible. On April 5th, I examined her again : she had gained $3\frac{1}{2}$ pounds more, making a total gain of 12 pounds in four months. The physical signs showed further improvement, the crepitant sounds having almost wholly disappeared, and the dull areas being now only about half as large as they had been four months previously. There were still signs of cavity at the right apex. The general appearance of the patient was so greatly improved that she was hardly recognised by some of those who had seen her previously. After four months of treatment the steadily progressive loss of weight had been arrested and replaced by a gain of twelve pounds, and the physical signs in her chest revealed the most remarkable improvement. The outlook has been totally changed.

These five cases are surely sufficient to prove that continuous antiseptic inhalation can sometimes cure cases which, apart from it, would have no hope of recovery. It ought not to be expected to cure cases which are actually moribund. Any case of pulmonary tuberculosis, if neglected long enough, may reach a stage in which it is incurable by any form of treatment. But the method is rarely disappointing in incipient and early cases. Where there is an apparent failure, it will usually be found to be due either to carelessness in the use of the method or neglect of some of the details, or to refusal to take sufficient nourishment, or to insanitary or unhygienic surroundings.

I claim that it deserves a careful trial in all cases of tuberculosis of the lungs, and that no tuberculin ought to be employed until this method has been first practised. If it be objected that this would make it impossible for the patient to continue at his work, I reply that in the best interest of the patient it is essential to secure a short period of complete rest. In slight cases this need not be longer than a week or ten days. In many early cases work may be resumed after this short interval if the antiseptic inhalation has been continuously employed, and if the patient will continue to employ it for three or four hours in the evening and also at night.

This period of rest and treatment may be passed in the patient's own home, if the sanitation is satisfactory, if he has a sufficiently large bedroom and keeps his windows open, and if proper attendance can be secured.

In many instances it will be better to remove the patient to a sanatorium for a month. The first fortnight would be spent in bed; after this he would be allowed to rise, wearing his inhaler continuously. A day or two later he would sit out of doors in open shelters, and would be allowed one hour's exercise every morning without his inhaler. When he returns home at the end of a month he will have gained several pounds in weight, and will be

so convinced of the value of the method that he will willingly continue its use in his own home.

In this way a small number of sanatorium beds would be able to benefit a large number of early cases.

When the infection is of a virulent type or has already existed for a considerable time, a longer period of treatment will, of course, be required. Yet it will usually be found that under continuous antiseptic inhalation improvement will be steadily progressive. If it should appear that a limit of improvement has been reached and the condition appears to be stationary, it would perhaps be advisable to make cautious trial of tuberculin. But I think it is very doubtful whether if continuous antiseptic inhalation fails, tuberculin will ever succeed. Probably in some cases an artificial pneumothorax will be of service.

Until all medical practitioners throughout the country have learned how to recognise a tuberculosis of the lungs without waiting for a bacteriological report, it is certain that many cases, which might have been arrested by the employment of continuous antiseptic inhalation, will be neglected until the morbid condition is so advanced that many months of treatment will be required. For these, long-continued residence in a sanatorium will be necessary. They ought not to be in the same wards as the incipient and early cases, but also they ought not to be sent to different institutions, for if separate hospitals are provided for the advanced cases, these hospitals will soon acquire the reputation of being "homes for the dying," and it will be very difficult to persuade patients to enter them. The presence of advanced cases in separate wards of the same sanatorium will involve no danger to the incipient cases when all sputum is carefully destroyed and all the patients are practising antiseptic inhalation.

Two points remain to be mentioned. The first is that the Yeo's inhaler must never be covered with silk, so as to obstruct the free passage of air through the perforations.

Unfortunately the makers have sometimes sent out "covered" inhalers, and this has caused difficulty. But with an uncovered inhaler the patient can breathe quite easily, and the theoretical objection that it hinders the access of air is quite without foundation. The second point is that in rare cases the patient is found to be unduly susceptible to iodine, still more rarely to ether; it is then necessary to modify the formula.

I believe that the general adoption of treatment by continuous antiseptic inhalation would mean a new hope for the consumptive, and a rapid diminution of the annual mortality.

But if we are really to "lay the axe to the root" of the disease it is essential that all general practitioners of medicine shall be enabled to diagnose an incipient tuberculosis of the lungs by careful percussion and auscultation without waiting for a positive bacteriological report, and that we should all carefully bear in mind that a negative report proves nothing and may be most delusive and disastrous. The early diagnosis of course requires care, but I believe that, by a proper physical examination, a correct opinion as to the fact of a tuberculous infection of the lungs (past or present) can always be formed, and that careful re-examination of the case after three or four weeks will always enable the physician to state definitely whether the infection is quiescent or active.



